the OIL AND GAS JOURNAL

FEBRUARY 25, 1957

Jersey looks at Ch. E. Grads

p. 84

finds them....

Strong on engineering knowledge, ethics.

Weak in communication—oral and written.

There's Plenty of Oil for Europe

Texas antes up extra 210,000 bbl.
Refinery cutbacks now total equal amount

p. 78

Biggest Fracturing Job Completed

p. 88

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U-36-A PERFORMANCE Best Proof of Design!

U-36-A cuts drilling time

FARNSWORTH, TEXAS — The J. M. Huber Corporation Rig No. R-6, now drilling near this Texas Panhandle community, is consistently cutting well drilling time. Recent wells drilled represent typical performance for this rig — 8050 feet in 24 days and 8301 feet in 22 days. This is two days ahead of average time for the field. Rig is reported to have pulled 7800 feet of 4½" drill pipe with thirteen 6¾ drill collars in 2 hrs. and 20 min. (90-ft. stands). It is a torque converter rig with U-36-A draw works especially designed for economical medium depth drilling, manufactured by Unit Rig & Equipment Co., Tulsa, Oklahoma.

The U-36-A is designed for drilling depths requiring a range of 300 to 600 horsepower with maximum operating economy assured for any drilling depth within the rig's horsepower range.

The fact that the U-36-A is a compact, highly portable unit means additional economy. Both single and double drum models can be trailer mounted.

Important optional features include pump drive, provision for automatic drilling control, and multi-speed rotary transmission.

If you're looking for a draw works with a proven record of high operating economy in the shallow-to-medium depth range, contact your nearest Unit Rig representative. He can give you more details on why the U-36-A is drilling wells faster — and cutting drilling costs!

Write Unit Rig in Tulsa for U-36-A Catalog.

UNIT RIG & EQUIPMENT CO. TULSA, OKLAHOMA U.S.A.

Unit Rig equipment sold through these distributors in the U. S. A. — American Pipe & Supply Co. — Bovaird Supply Co. — Houston Oil Field Material Co. Inc. — Industrial Supply Co. Inc. — Iverson Supply Co. — Lucey Products Corporation — Mid-Continent Supply Co. — Norvell — Wilder Supply Co. — Republic Supply Co. of California — United Supply & Mfg. Co.

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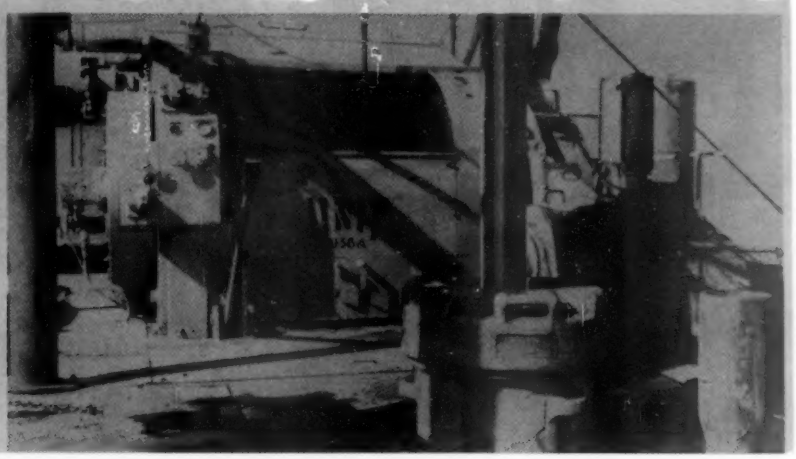

A Glance Ahead

- **The family auto has reached a point** where it's getting fewer miles per gallon. Consumption per mile is rising in spite of higher-octane gasoline and greater engine efficiency obtained through higher compression ratios. The real culprit is increasing horsepower. For years car makers and refiners had improved their engines and fuels to offset the extra demands of greater power. But it doesn't appear possible any longer. Engine designers and refiners alike are wondering just how much longer car buyers will continue to demand more horsepower and be willing to pay for it in higher car prices and greater gasoline consumption.

- **Look for more turbocharging** in big engines, especially those on big-inch gas pipelines. Turbocharging and series (stage) turbocharging are boosting horsepower as much as 40 per cent. And the increased power is being obtained without adding housing, foundation piping, and other costs.

- **Some commercial aircraft manufacturers** are bringing up JP-4 type again as the recommended fuel for their domestic airline customers. Convair says its new "880" should operate on this wider range cut, rather than kerosine. Others specify JP, kerosine, or gasoline types. Lockheed is calling for a —50° F. freezing point for trans-oceanic service in the new DC-8 but will settle for —40° F. for domestic flights.

- **Pipeline contractors are doing more** and more of the engineering work for new pipeline systems. In years past, the pipeline companies did all their own design work. One reason for the switch is the shortage of engineers in the pipeline companies. As the firms began to lean on contractors for engineering advice, some contractors formed departments, and some have even formed separate companies to handle this type of work.

- **With not quite 2 months gone,** the industry is seeing another record exploratory year unfold. Wildcat completions are running ahead of 1956. Important strikes in most oil provinces point to big things ahead.

  There are several outstanding areas to keep an eye on in the next few weeks. Paradox basin: Aneth is growing fast. Williston basin: Pre-Madison exploration is picking up. Hugoton area: Deep Morrow discoveries have been made inside and outside the Permian producing areas. Oklahoma: Knox field's deep Ordovician campaign is promising, and you can expect still deeper exploration in the Anadarko basin. The Ordovician and Siluro-Devonian play in south-central Oklahoma appears to be a major development.

- **Octane requirements will go up soon** on gasoline moved through Great Lakes Pipe Line Co. Talk among shippers is that new specifications will be 89 octane for regular and 98 for premium. This is an increase of 1 number for regular and 2 for premium. Reason for the change: Competition in the field of quality.

- **Competition among pipelines** to connect new leases has been increased by the emergency European supply program. Many West Texas wells have been hooked up. And in parts of Oklahoma, which benefited relatively little from the increased demand, pipelines have been scrambling for new connections. This is the first instance of such activity in Oklahoma in years, although oil carriers are always competing for new business.

the OIL AND GAS JOURNAL

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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TECHNOLOGY–OPERATION

Drilling-Production

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By J. L. Lummus and P. P. Scott, Jr.

An 8-in.-diameter cyclone is capable of removing 77 to 100 per cent of sand and cuttings and reclaiming 82 to 98 per cent of lost-circulation materials from drilling fluids.

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By G. L. Farrar

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By Larry Resen

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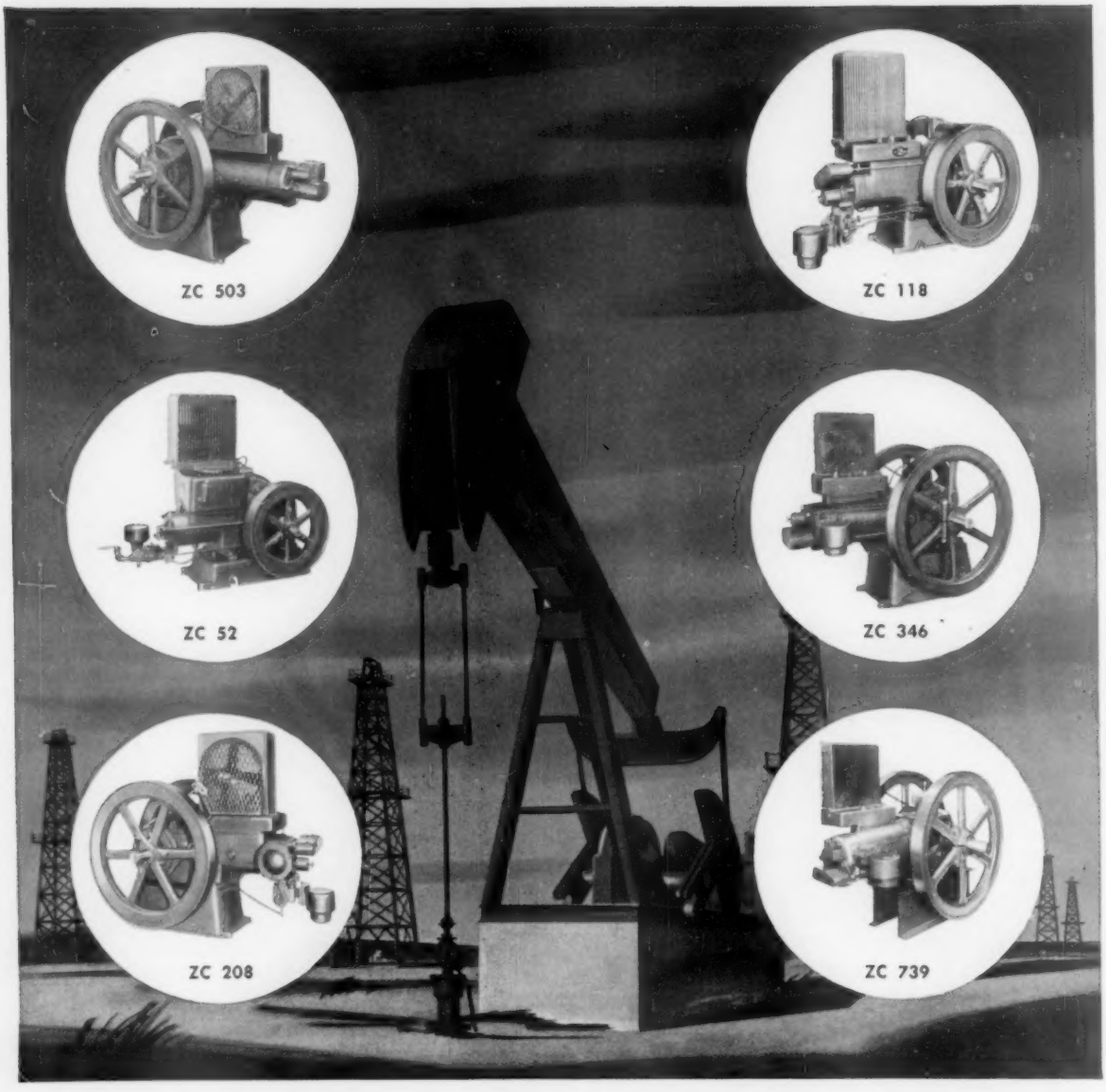

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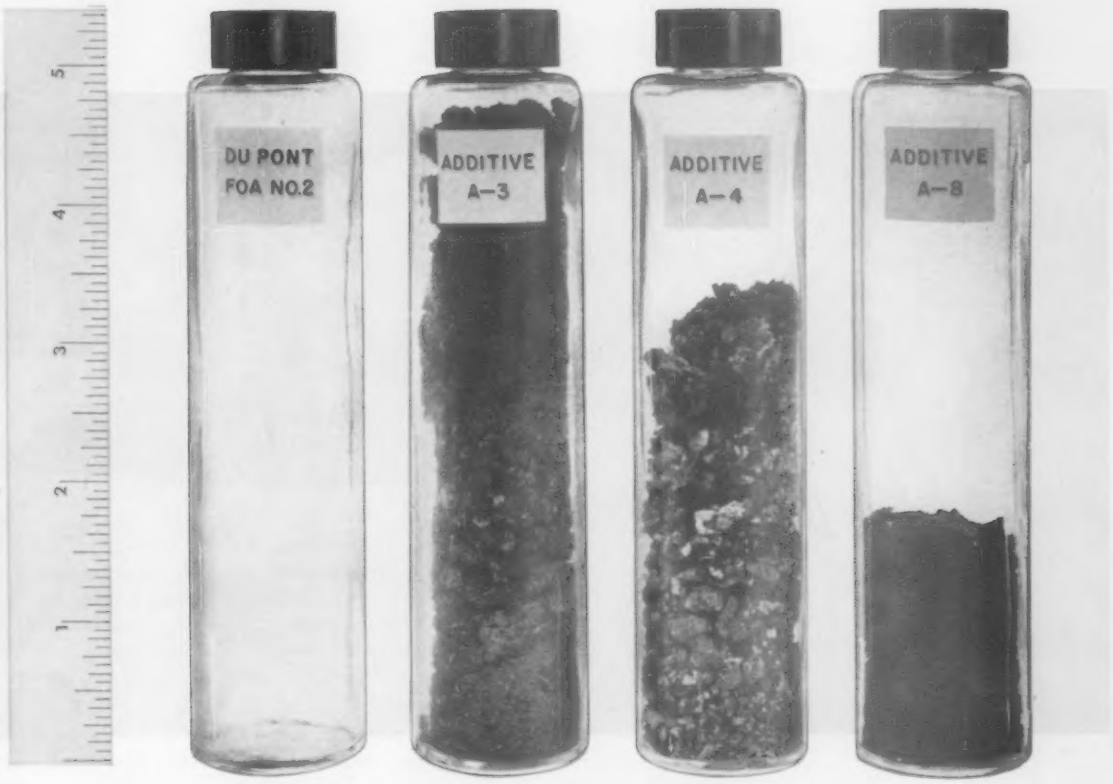

An empty bottle . . .

clue to deposit-free heating and diesel fuels

In Du Pont Fuel Oil Additive No. 2 (FOA-2) you'll find not only an effective stabilizer and sludge dispersant, but an additive that's *ashless.*

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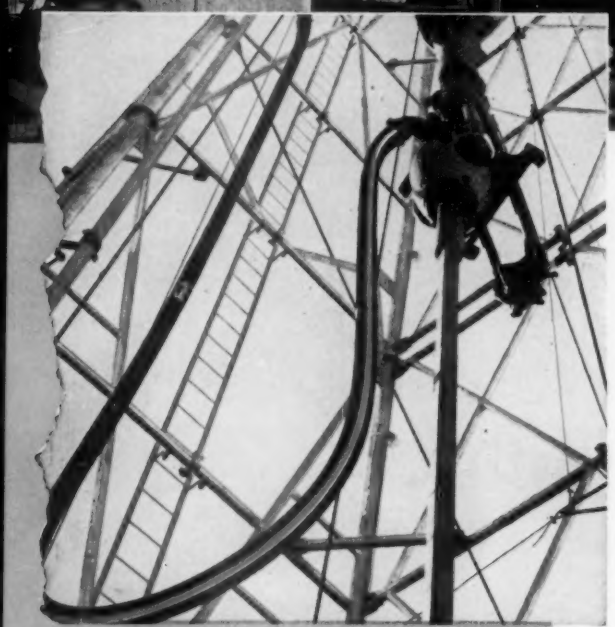
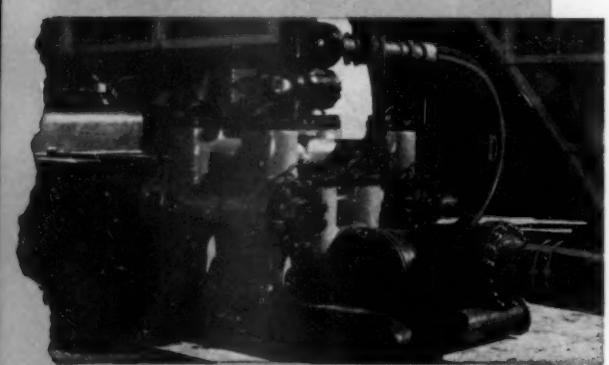


Powerflex Pressure Seal Rotary Hose, with patented forged steel couplings, combines light weight with great strength.



Mud-Flo Suction and Flexible Discharge Hose cuts down on rig-up time and reduces vibration in the mud lines.

THERMOID HOSE is made by patented and exclusive construction methods for each type of oilfield service . . . and is designed with extraordinary strength to withstand the high-pressure and pulsation stresses that are peculiar to drilling applications. That's why "Oilwell" stocks and recommends Thermoid products.

THERMOID POWERFLEX ROTARY HOSE . . . is a rugged combination of high-tensile steel cable, heavy-duty fabric and oil-resistant synthetic rubber; bonded together to produce a tough, abrasion-resistant hose that is unrivaled for strength and flexibility. Full-flow steel couplings are securely anchored. Each length is proof tested to 5000 lbs.

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THERMOID MUD-FLO SUCTION HOSE . . . is made with thick oil-resistant inner tube firmly bonded to strong cotton fabric. Heavy galvanized round wire reinforcement is embedded in rubber compound to absorb pumping vibrations and provide unobstructed flow.

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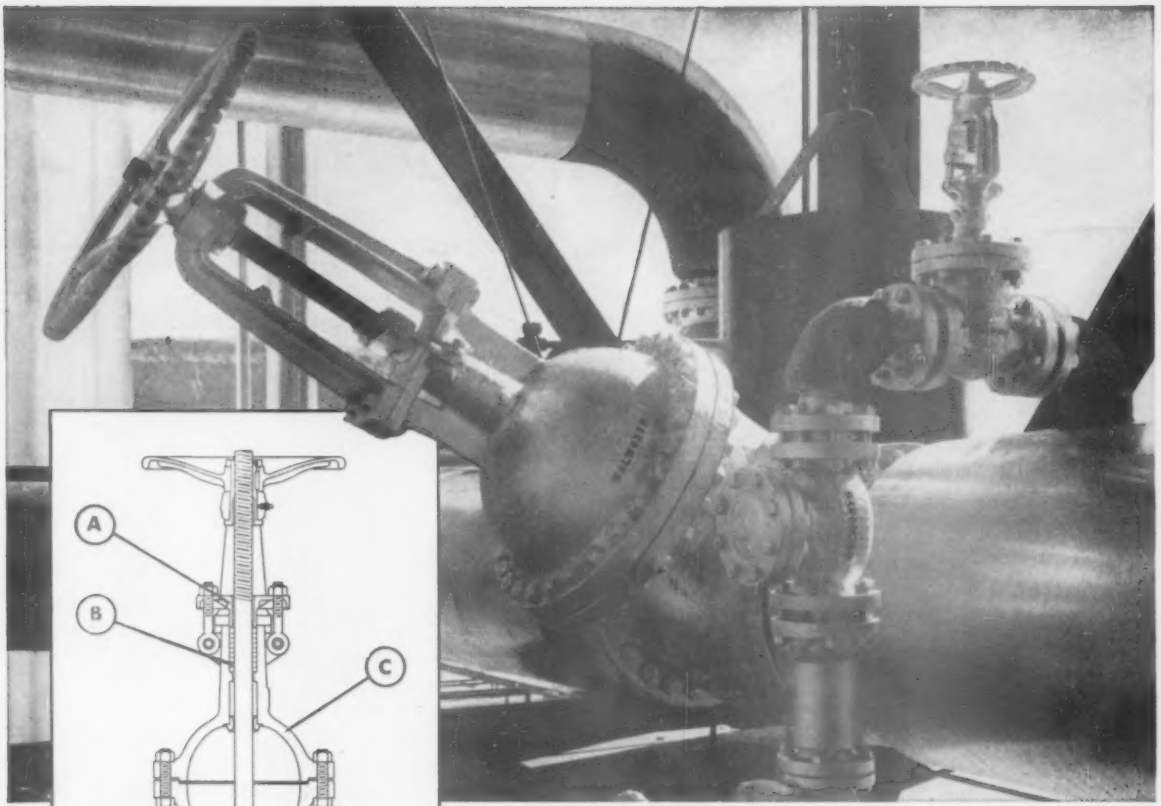

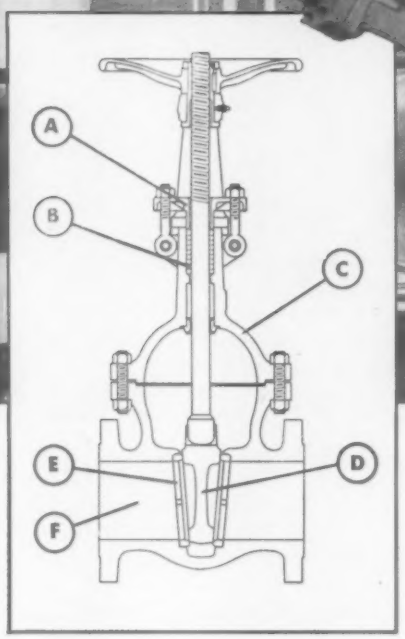

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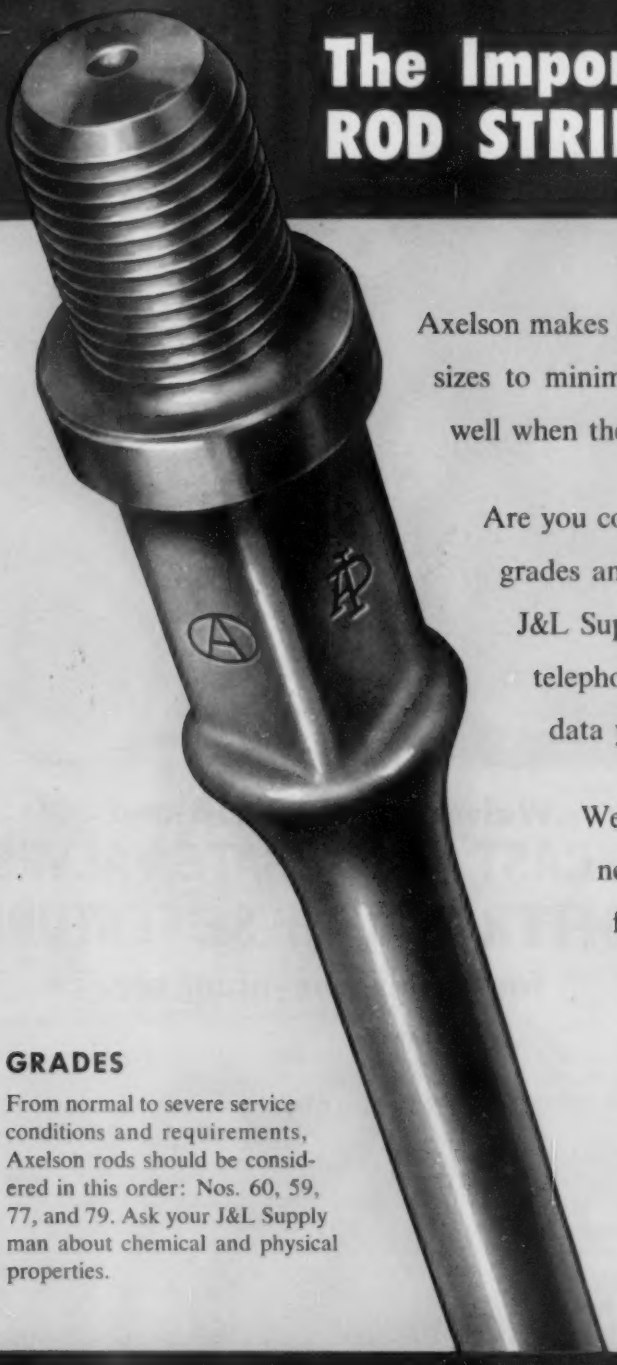
The Importance of ROD STRING SELECTIONS



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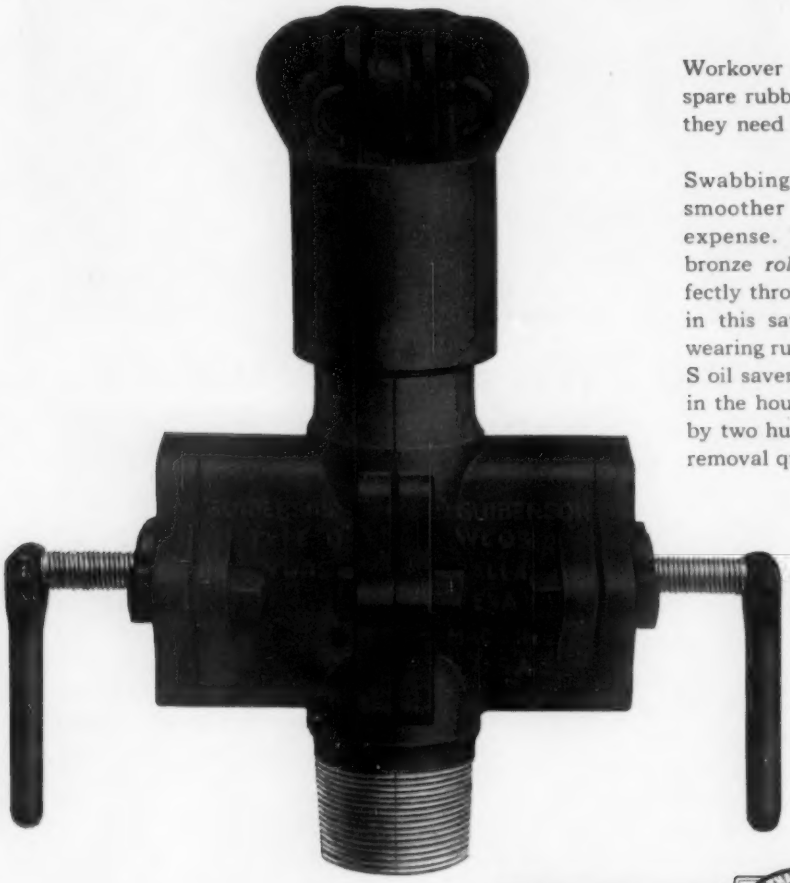

Workover crews tell us they keep fewer spare rubbers on the rig for this saver — they need changing so seldom.

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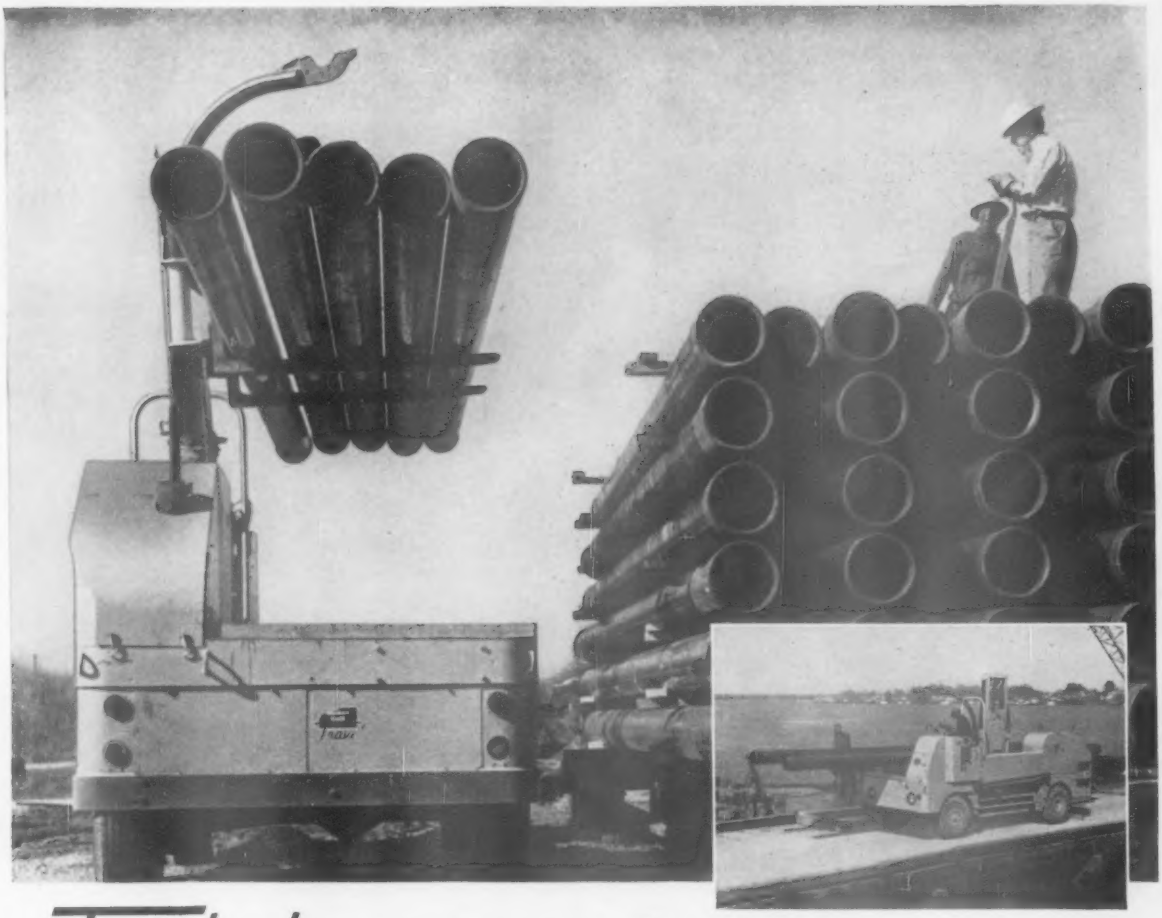

®Traveloader replaces 3 trucks and releases 6 men for other work!

● A Traveloader is used by Kyle-Taylor Lumber Company, Berwick, La., to transport pipe from river dock to storage. It has replaced two pipe trailers and a gin-pole truck formerly used on this job, reduced man-power required from 15 to 9 and made time savings of about 70%.

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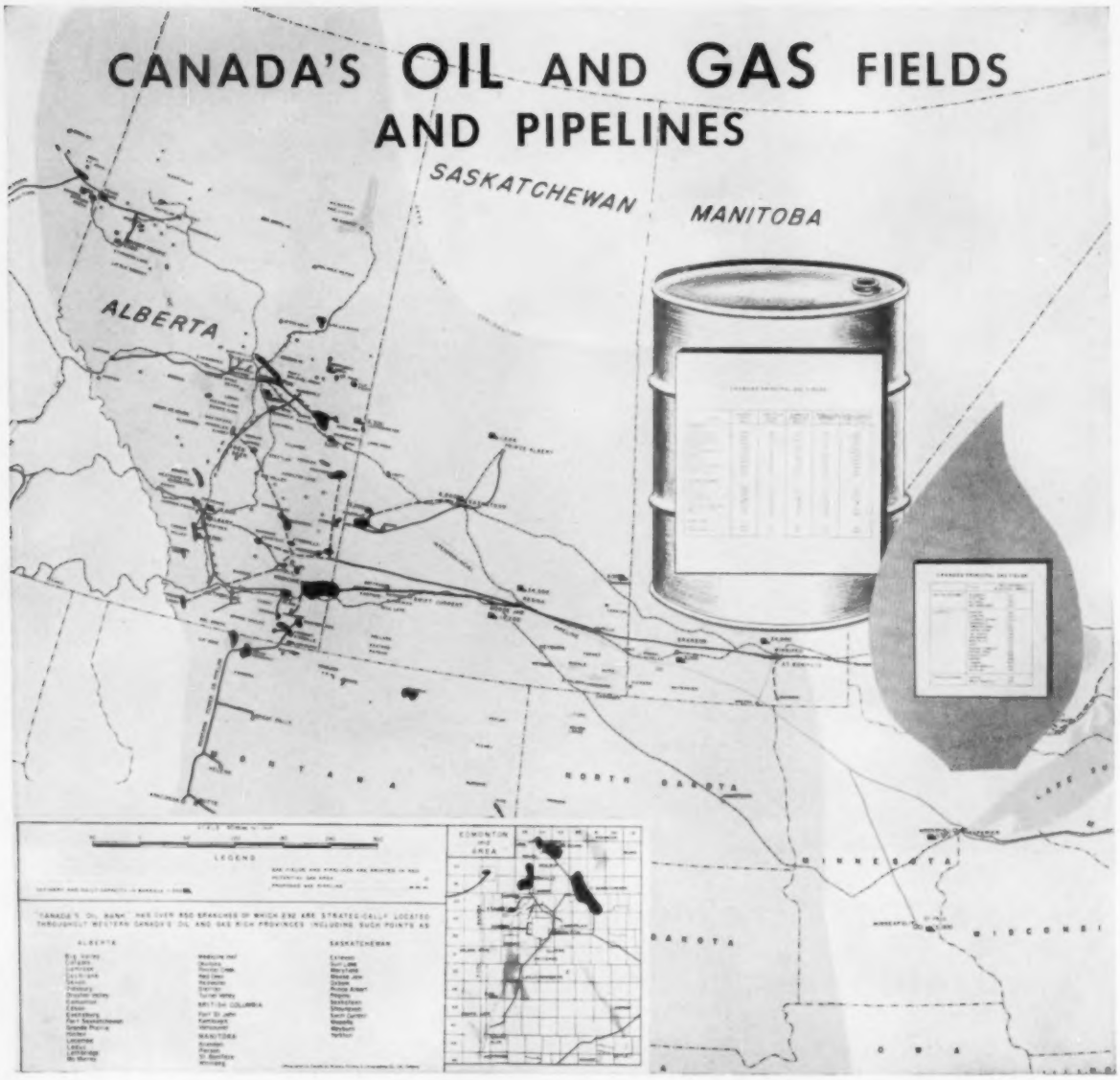
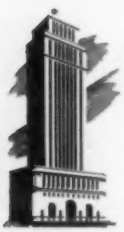


get this map of buried treasure!

Prepared by the Oil and Gas Department of The Royal Bank of Canada—Canada's "Oil Bank"—this new map measures 43" x 23". Scaled 60 miles to the inch and lithographed in three colors, it shows Canada's principal oil fields, pipelines, potential oil areas, proposed oil pipelines, refineries and daily capacity in barrels. For a copy of this free map and a list of the Royal Bank's current *"Oil and Gas Bulletins"* write to: The Royal Bank of Canada, Oil and Gas Department, 409 8th Avenue West, Calgary, Alta., Canada. These *"Oil and Gas Bulletins"* are revised by the bank as necessary and cover statistics, regulations, tariffs, oil and gas financing and kindred subjects. They are up-to-date and of practical value to anyone seriously interested in Canada's oil and gas industry.

We do not provide information on oil securities.



THE ROYAL BANK OF CANADA

Canada's Oil Bank

New York Agency—68 William Street, New York 5, N. Y.
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Assets exceed 3½ billion dollars

Over 870 branches in Canada, the West Indies, Central and South America. Offices in New York, London and Paris.

Drill faster, use fewer bits

TRIMULSO*
Trade Mark
Baroid Division,
National Lead Company.

with this field-proved oil emulsion drilling fluid...

- Used successfully in over 500 wells
- Drills more feet per hour
- Reduces torque and corrosion
- Unaffected by hardness or brine content of water
- Mud viscosity easily decreased or increased
- Non-foaming; doesn't need constant attention

TRIMULSO* emulsion mud, made with Aquaness emulsifiers, is the original high speed drilling fluid emulsifier. It is paying off in faster, trouble-free drilling in hundreds of wells, in many different formations. For full facts, write to Baroid or call your local Baroid service man.

U. S. SMELTING, MINING & REFINING COMPANY REPORTS

trouble-free hole in Federal MacIntyre No. 1, near Craig, Moffat County, Colorado, being drilled by Signal Drilling Company with their Rig No. 2. They used TRIMULSO emulsion from 3000 feet. Numerous drill stem tests were run, and E. F. "Buck" Lain, toolpusher, says he had "no hole trouble." The photograph was taken at 6500 feet, and projected depth of well is below 11,000 feet.

LOOK FOR THE AQUANESS SEAL

. . . it identifies the original high speed drilling fluid emulsifier, made by Aquaness to highest standards of uniformity for leading mud companies.

ATLAS

Aquaness *Department*

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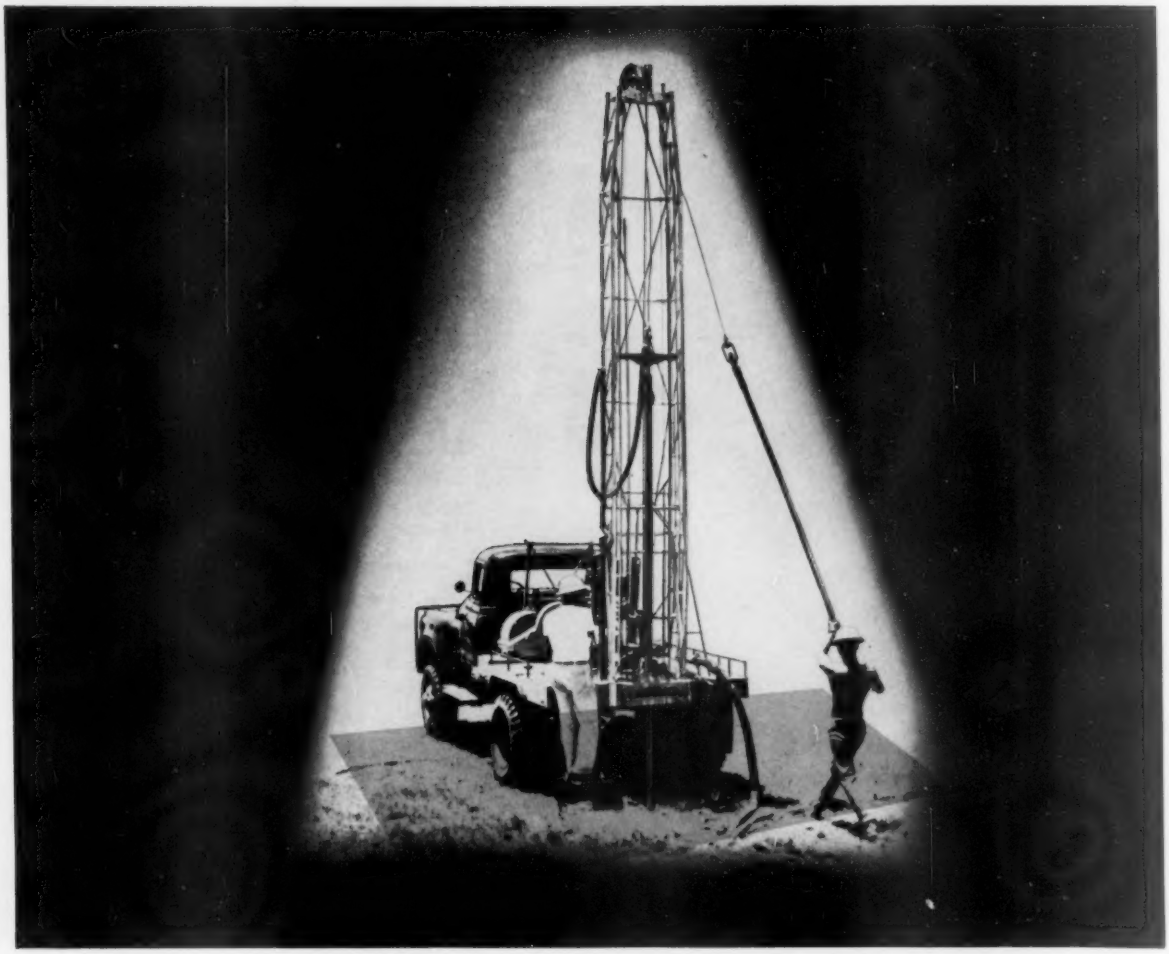

THE *Joy 35* SHOT HOLE RIG...MOVING FAST

A shot hole rig has to get around . . . has to get in . . . get the hole down . . . and get out. That's the Joy "35". It's lightweight—extremely portable . . . mounted on a short wheelbase truck, it gets in anywhere. It gets hole down fast because it's the only rig of its size that has four speeds forward . . . gives you just the right speed for the formation being drilled to get the fastest penetration. And the Joy "35" stays on the job. The entire machine is built as a group of unit assemblies . . . each of which can be replaced or exchanged independently.

Find out more about the rig that is moving fast—the Joy "35" . . . write ***Joy Manufacturing Company, Oil Field Drill Division, P.O. Box 35326, Airlawn Station, Dallas 35, Texas.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Get complete details on the C-35. Write for bulletin 152-31

WSW 06467-152

JOY...EQUIPMENT FOR OIL FIELDS

27 SALES & SERVICE LOCATIONS

Denver, Colo.; Salt Lake City, Utah; San Francisco and Los Angeles, Calif.; El Paso, Texas; Carlsbad, N.M.

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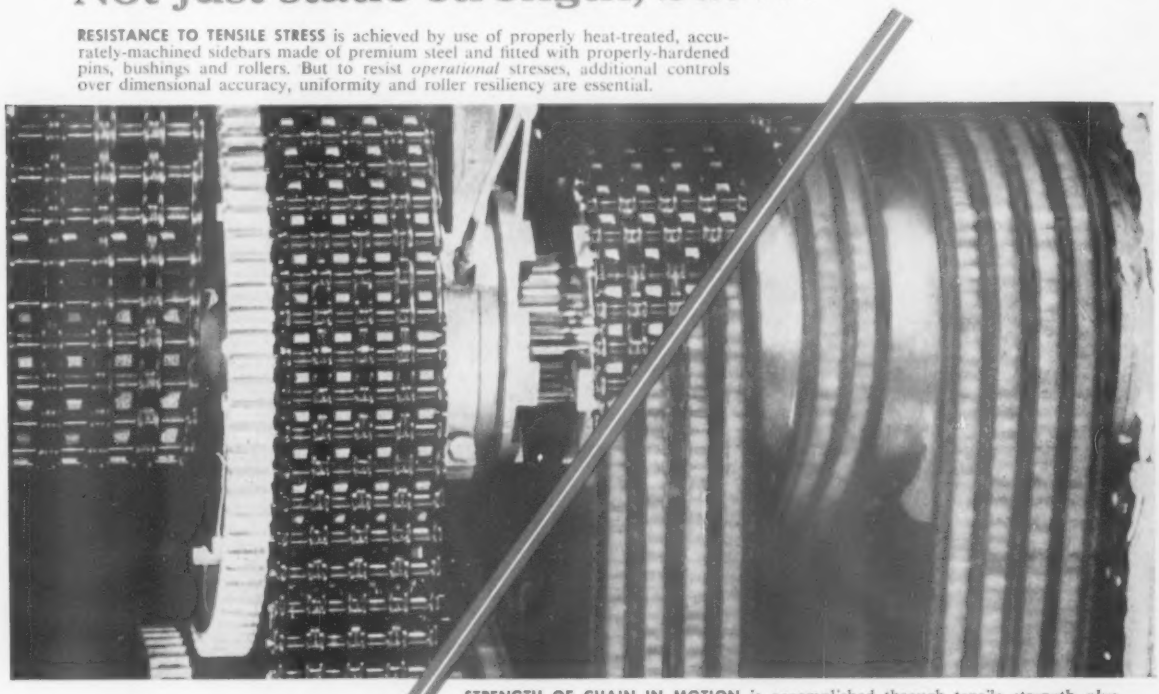
Export Sales—Joy Manufacturing Company, 60 E. 56th St., New York, N. Y.

Not just static strength, but . . .

RESISTANCE TO TENSILE STRESS is achieved by use of properly heat-treated, accurately-machined sidebars made of premium steel and fitted with properly-hardened pins, bushings and rollers. But to resist *operational* stresses, additional controls over dimensional accuracy, uniformity and roller resiliency are essential.



STRENGTH OF CHAIN IN MOTION is accomplished through tensile strength *plus* special Link-Belt refinements. These include pitch-hole preparation, micro-finish of parts, special processing of sidebars, prelubrication and rigid quality control from initial selection of materials to final protective boxing. Here dynamic strength assures top efficiency on this Brewster N-12 drawworks transmission.

dynamic strength

assures longer work-life for LINK-BELT Roller Chain

INCREASED stresses of today's longer drill collar strings, greater hook loads and higher horsepowers and speeds require endurance never before demanded of roller chain. Link-Belt's solution: greater dynamic strength, achieved through design, manufacturing and processing "extras" . . . plus a combination of other important refinements. And you get results in more efficient performance that lasts measurably beyond the life of ordinary roller chain—cut downtime and drilling costs.

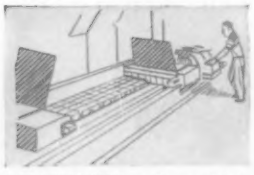
Get full information on the complete Link-Belt range of single and multiple widths up to 3-inch pitch. Ask for your copy of Book 2680 at your nearest Link-Belt office or any leading supply store in the field.

LINK-BELT

ROLLER CHAIN & SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14.225

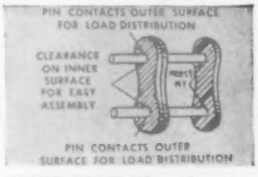
LINK-BELT gives you dynamic strength that comes from these important EXTRAS



PRE-STRESSING of multiple width chain provides uniform load distribution.

SHOT-PEENED ROLLERS have greater fatigue life, added ability to withstand impact.

SHEPHERD'S CROOK COTTERS will remain in place under severe operating conditions.


PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION
CLEARANCE ON INNER SURFACE FOR EASY ASSEMBLY
PIN CONTACTS OUTER SURFACE FOR LOAD DISTRIBUTION

FASTER COUPLING and uncoupling of multiple width chain with E-Z Assembly feature.

No. 2 advertisement of six proving . . .

why Jones sucker rods last longer

1. Advanced Research and Development
2. Advanced Engineering Experimentation and Control
3. Advanced Metallurgy and Heat Treating
4. Advanced Manufacturing and Production
5. Advanced Inspection and Testing Techniques
6. Advanced Field Engineering and Service

There is a

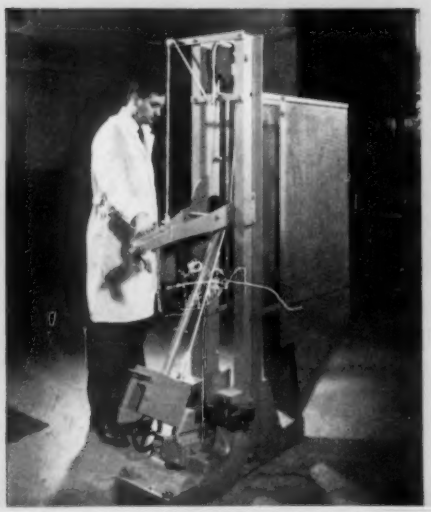
The S. M. Jones Company ADVANCED ENGINEERING, EXPERIMENTATION AND CONTROL

Year after year, for over 65 years, Jones engineers have solved problem after problem and have kept Jones Sucker Rods the standard of comparison. But the policy of the Jones engineering department is never to be satisfied, never to rest on laurels already won.

To this end Jones engineers have the use of a large fund of accumulated practical knowledge gained from years of laboratory and field tests. Thus Jones customers are assured of the earliest possible use of definite improvements.

The Jones engineering department keeps a tight control throughout all operations from raw stock to the finished sucker rod. Laboratory testing for correct alloy content and physical properties, after proper heat treatment, assures Jones using only the best steel completely free of defects. Controlled normalizing and tempering results in a microstructure which is uniform throughout.

There is no substitute for Jones experience and thoroughness in engineering, experimentation, and control. The continued leadership of Jones Sucker Rods is proof of that.

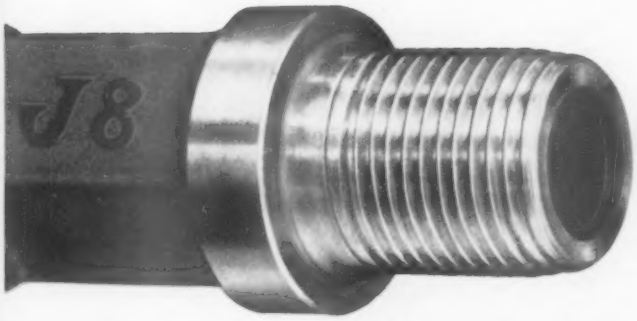


Above: All A.P.I. working gages are checked daily with master A.P.I. gages which are periodically certified by the National Bureau of Standards, Division of Metrology. Control like this insures uniformity of threads.

Left: Resistance to impact of heat treated sucker rod stock and experimental alloys is studied with this Izod-Charpy impact testing machine.

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

difference in sucker rods



TYPE 8

JONES

alloy SUCKER RODS

For extremely heavy pumping loads.

This rod is the result of long research and field use to produce the very best rod for exceedingly heavy pumping. It is made of special alloy steel of exceptional yield strength and well-balanced physical properties.

Specify Jones Sucker Rods for proved longer life.

FOUR TYPES OF JONES SUCKER RODS FROM WHICH TO CHOOSE

Type	Identification	USE	DESCRIPTION	PHYSICAL PROPERTIES					
				Yield 1000 psi	Ultimate 1000 psi	% Elong. in 8"	% Red. of Area	Izod	Brinell Hardness
J-12	Protector ends painted BLUE	For heavy pumping loads under all conditions	Made from processed electric furnace steel with high yield strength and excellent fatigue resistance.	95-105	110-125	13-17	65-75	90-110	229-260
J-8	Protector ends painted BLACK	For extremely heavy pumping loads	A special alloy steel of exceptional yield strength and well-balanced physical properties.	100-115	120-135	10-15	50-60	85-85	240-280
J-7	Protector ends painted ORANGE	For medium to heavy pumping loads under all conditions	Called "standard of the industry". Strong, corrosion resistant nickle molybdenum steel, fully normalized, tempered, descaled and shot peened for further fatigue and corrosion resistance.	85-90	85-100	14-22	60-70	90-107	170-210
J-2	Protector ends painted WHITE	For medium to heavy pumping loads in non-corrosive fluids	High grade carbon manganese steel, fully normalized, descaled and shot peened to add strength and endurance.	60-75	90-105	18-24	60-70	60-90	160-210

Jones Pony Rods carry the same physicals as Jones Sucker Rods. Always use proved superior Jones Pony Rods with proved superior Jones Sucker Rods.

THE S. M. JONES COMPANY

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Division of Buffalo-Eclipse Corporation

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Solvent Decarbonizing gets

MORE

OUT OF YOUR CAT CRACKER

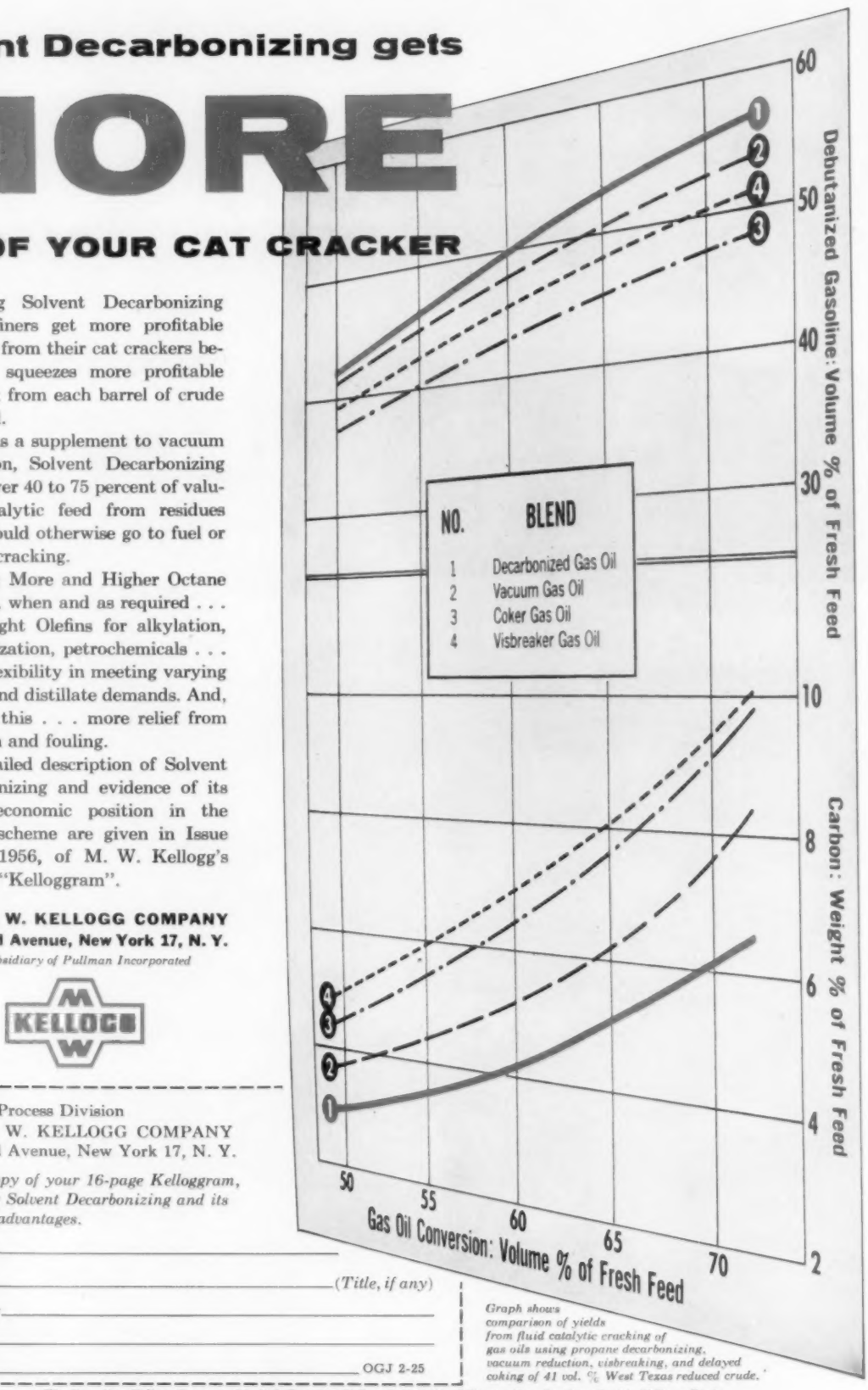
Kellogg Solvent Decarbonizing helps refiners get more profitable products from their cat crackers because it squeezes more profitable feedstock from each barrel of crude processed.

Used as a supplement to vacuum distillation, Solvent Decarbonizing can recover 40 to 75 percent of valuable catalytic feed from residues which would otherwise go to fuel or thermal cracking.

Result: More and Higher Octane Gasoline, when and as required . . . More Light Olefins for alkylation, polymerization, petrochemicals . . . More Flexibility in meeting varying fuel oil and distillate demands. And, with all this . . . more relief from corrosion and fouling.

A detailed description of Solvent Decarbonizing and evidence of its strong economic position in the process scheme are given in Issue No. 3, 1956, of M. W. Kellogg's 16-page "Kelloggram".

THE M. W. KELLOGG COMPANY
711 Third Avenue, New York 17, N. Y.
A Subsidiary of Pullman Incorporated



Graph shows comparison of yields from fluid catalytic cracking of gas oils using propane decarbonizing, vacuum reduction, visbreaking, and delayed coking of 41 vol. % West Texas reduced crude.

Refinery Process Division
THE M. W. KELLOGG COMPANY
711 Third Avenue, New York 17, N. Y.

Send copy of your 16-page Kelloggram, describing Solvent Decarbonizing and its economic advantages.

Name_____

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Company_____

Address_____

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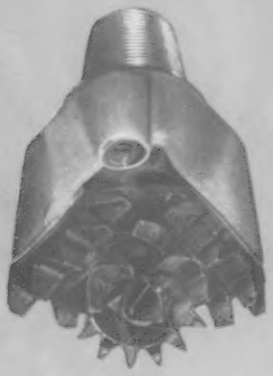
Kellogg Pan American Corporation, New York • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

more weight means more hole

with CP Rock Bits



CP Three Cone Rock Bits can take the extra weight that gives deeper penetration . . . and they stay in the hole longer. Here's why: CP Bits have the heaviest bearings in any rock bit. Tungsten Carbide on teeth gage points give increased wear resistance. CP Three Cone Rock Bits are available in seven different types for all kinds of formations, from soft to exceedingly hard and abrasive.

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5000 U. S. Highway 81 South
Fort Worth, Texas

Chicago Pneumatic

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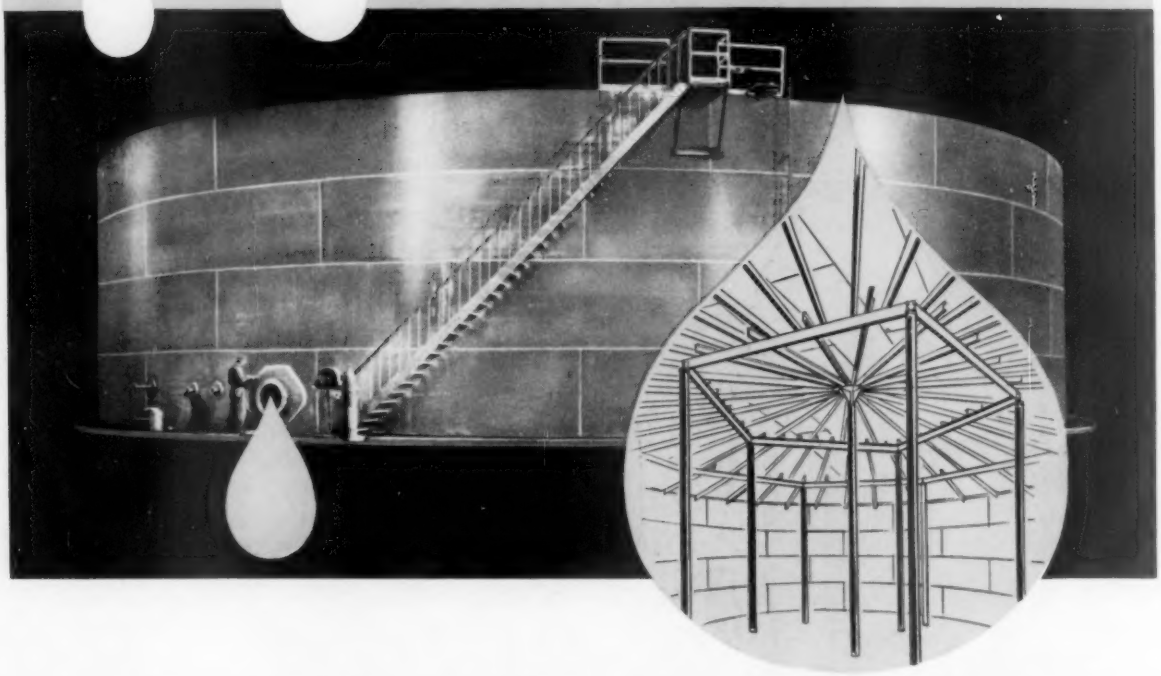
THREE CONE BITS • REAMING BITS • REAMERS • DRILL COLLARS • TOOL JOINTS • SUBS • JUNK BASKETS

Aluminum—1st Choice
for Giant Ammonium Nitrate Tank

No other corrosion-resistant metal could do the job at such low cost!



Aluminum is one of the few metals that can resist the strong corrosive action of ammonium nitrate and other chemicals. And no other metal can store chemicals as economically as aluminum.

That's why Aluminum was specified for the Mississippi River Chemical Company's newest tank for storing 83% ammonium nitrate solution. The Nooter Corporation, St. Louis, fabricated this tank—100 feet in diameter and 23 feet 2½ inches high—from 5052-H112 aluminum plate over interior structural members of 6061 aluminum.

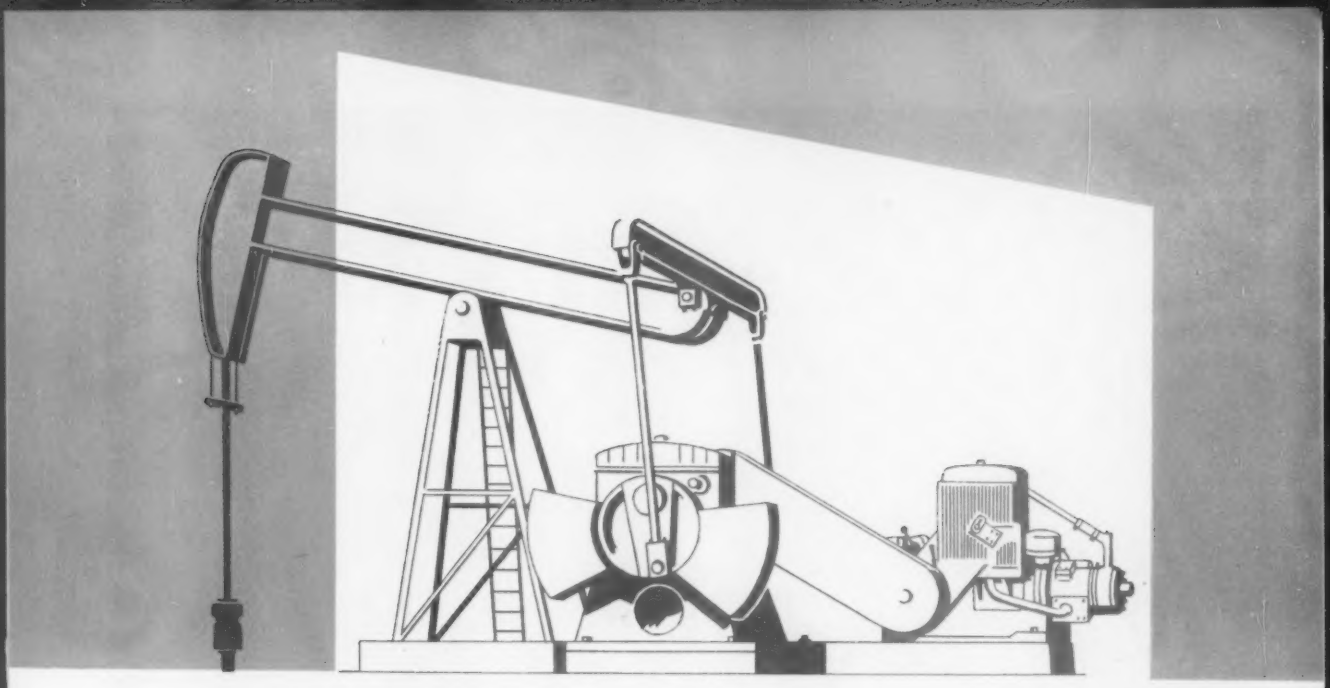
When stored in aluminum tanks, the *stability* of ammonium nitrate is assured. And aluminum tanks give extra-long service, under constant exposure to corrosive attack, with a minimum of maintenance.

For facts and figures on other applications of aluminum in the chemical industry, see our new 16 page brochure, "Reynolds Aluminum Tanks and Vessels". To get your *free* copy, write to *Reynolds Metals Company, P. O. Box 1800-CR, Louisville 1, Ky.*

See "CIRCUS BOY", Reynolds exciting dramatic series, Sundays on NBC-TV.

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

REYNOLDS ALUMINUM



HOW TO LOWER PRODUCTION COSTS:

Power your pumper

WITH *Ajax* and *Gas*

The fog of questions about rising production costs and narrowing profit margins can be swept away by a single sunlit fact: you can usually save half the cost of your engine each year with AJAX and gas! After two years, you have only negligible maintenance and fuel to pay for—from then on out, years of continued profit. More facts? Write us—see your Supply Man!

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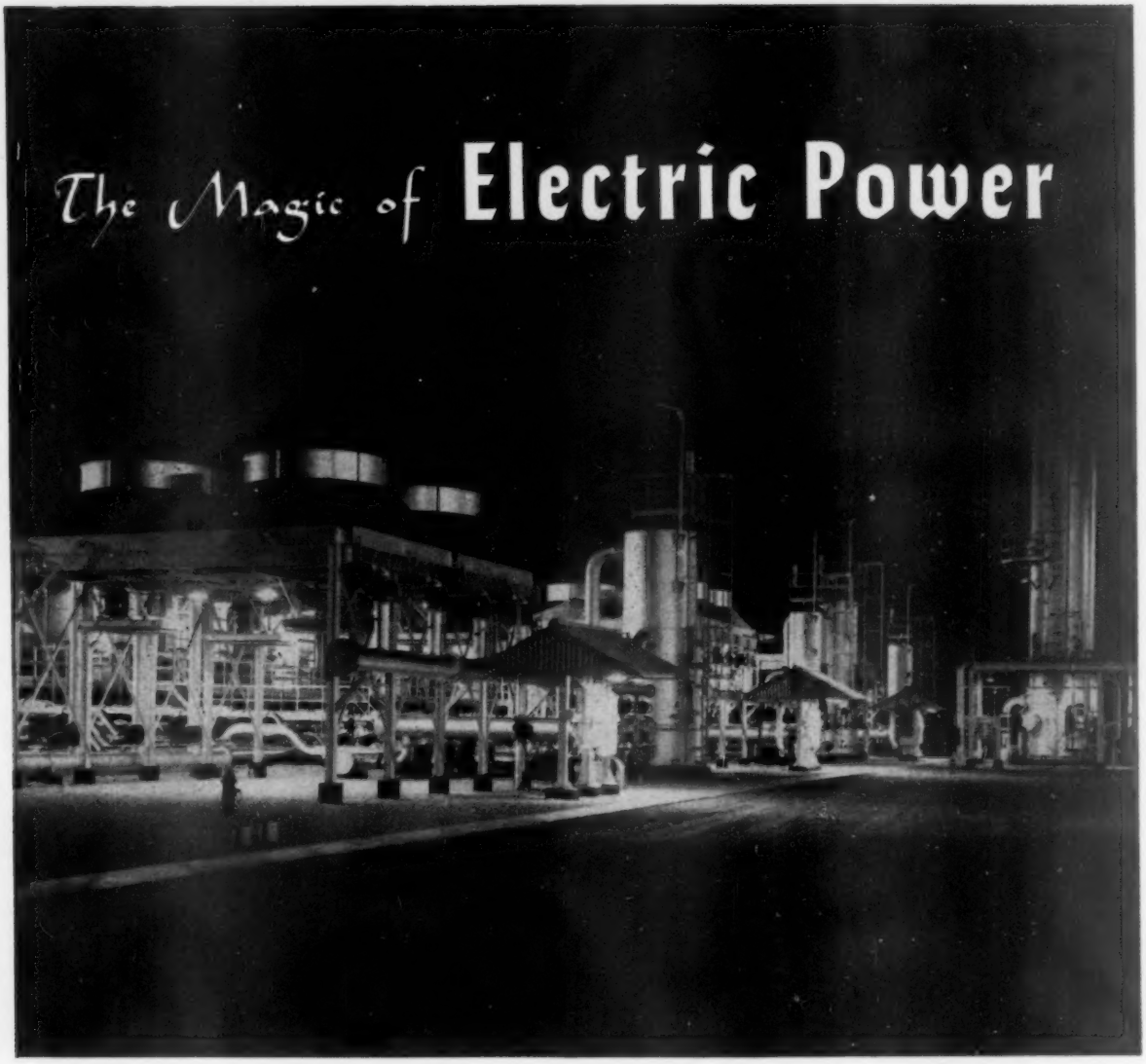
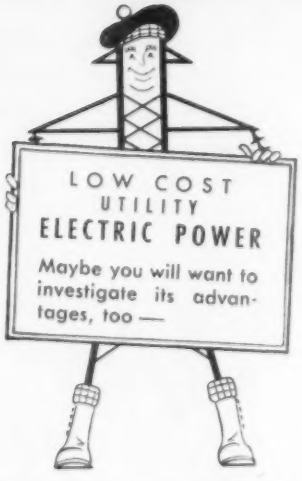


Service... Dependable Service

Next to a captivating sunset nothing has such a magical appearance as a giant refinery flooded by the grandeur of electric light on a pitch dark night.

Spectators view it with unceasing awe — Businessmen view it as a well-lighted, efficiently powered investment. Over 72 per cent of this nation's refineries utilize dependable purchased Electric Power. More cost conscious men are specifying it every year.



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Baash-Ross **KELLYS**
are first choice because...

Unusually accurate bore due to "Know How" and advanced machining techniques.

Joints are "Hob Cut" to eliminate human error.

Precise machining not only meets but exceeds API specifications.

Each heat of steel checked for quality by separate test specimens.

High physicals insure inherent strength.

BAASH-ROSS makes Kellys in all sizes—all designs (square, hexagon and octagon) and all lengths...plus incorporating the most advanced construction and metallurgical features. No effort is spared to insure you that a B-R Kelly is the very best that money can buy.

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TOOL COMPANY
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For further information write P.O. Box 1348, Houston 1, Texas or see The Composite Catalog.

On the go for good reason

(Dow technical men bring lab experience to the field)

Yesterday, it was Odessa. Today, Albuquerque. Tomorrow? It all depends on where a problem crops up on the use of ethanolamines.

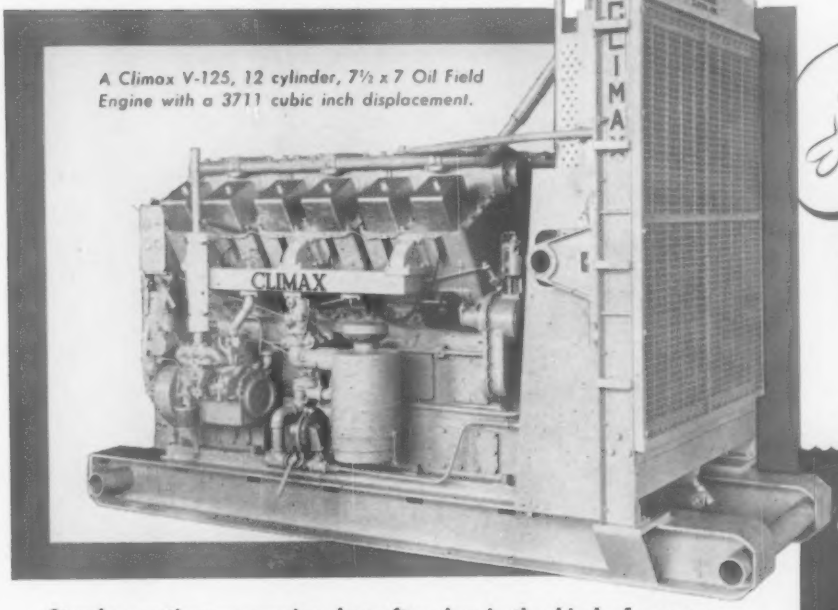
Wherever it is—there you're likely to find one of our technical service representatives giving on-the-spot help.

Working on many different problems in many places, these technicians have accumulated much knowledge on the use of mono- and diethanolamines, as well as diethylene and triethylene glycols. They also have complete research facilities at their disposal. Either through literature reference or research, solutions are fast coming. Time and money are saved.

Thanks to our traveling technicians, pipeline transporters have a grasp on the future . . . a future that keeps flow on the go by solving gas sweetening and dehydrating problems, today. THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. GD 817H.

YOU CAN DEPEND ON DOW

25,000 hours and more between overhauls!



A Climax V-125, 12 cylinder, 7½ x 7 Oil Field Engine with a 3711 cubic inch displacement.

...CLIMAX of course!

Steady, continuous service day after day is the kind of power that really pays off in the oil fields — the kind of power that you can be assured of when you buy a Climax.

BIG CHIEF DRILLING CO., OKLAHOMA CITY, OKLA., has this to say of their twelve Climax V-12's —

> **"The service rendered us by these engines has been excellent and we expect to purchase Climax engines should we add additional rigs in the future. We consistently get approximately 25,000 hours of deep drilling between overhauls and certain engines have exceeded this performance considerably."**

Stop in at your nearby Climax distributor today. He will gladly show you actual case histories of the many drillers in his territory who have also found that you can't beat a Climax for downright dependability.

Climax drilling engines operate on Natural Gas or Butane and are available in a range of sizes up to 600 H.P.

OUTSTANDING FEATURES OF CLIMAX V & K SERIES ENGINES

- All models have renewable cylinder sleeves.
- All intake and exhaust valves are free-to-rotate type.
- All crankshafts are supported by bearings on each side of each crankthrow.
- All connecting rods are rifle drilled for pressure lubrication of piston pins.
- All cylinder heads have Climax high-turbulence type combustion chambers which produce maximum fuel economy.
- All models have the Climax consistent design that makes possible maximum interchangeability of wearing parts.

WHERE POWER IS YOUR PROBLEM - CLIMAX IS YOUR ANSWER

climax

BLUE STREAK ENGINES

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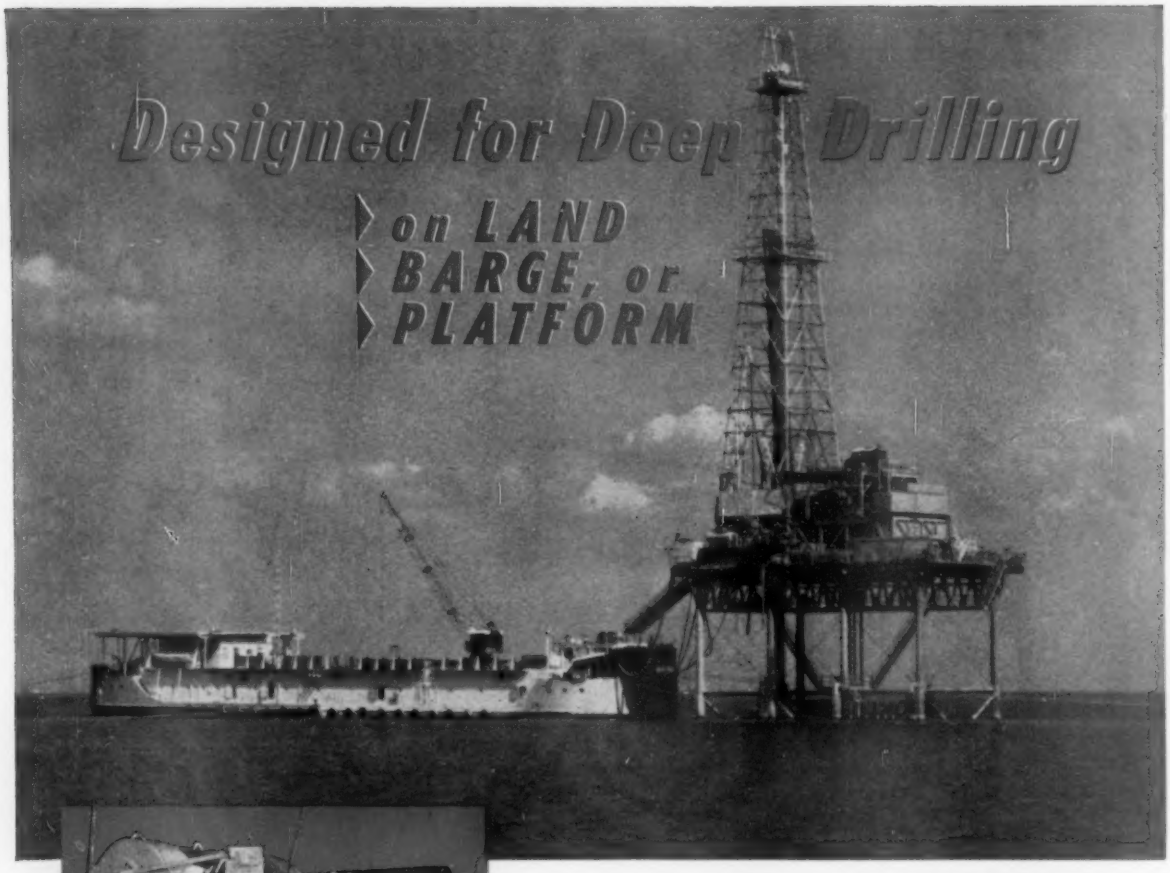

- Adjusting linkage and exposed hardware protected against corrosion by special plating.
- Sectional construction facilitates transportation.
- Six hoisting and three rotary speeds.
- Two 42-inch VC 1200 Fawick Vontorque clutches on drum shaft.
- Parkersburg hydromatic brake or Dynamatic brake on extended drum shaft.
- 22¼" x 57" drum, with 80" x 18" water circulating brake rims.
- Coring reel package, friction clutch controlled, optional.
- As an electric rig—drawworks can be furnished with friction or jaw clutches.

M-CS6-2

Unit Rig U-1220* Drawworks

The Model U-1220 was developed specifically for deep drilling. It meets all requirements for extreme depths, portability and endurance—regardless of location.

The rig shown above drilling in the open Gulf is equipped with a Unit Rig Model U-1220 drawworks, and a 3-engine rig drive. The drilling barge tender carries 3 Emsco D-700 slush pumps, powered through an LS1420 Unit Rig 3-engine, 3-pump drive compound by 3 PTDS-8 Superior diesel engines.

All major drilling equipment was furnished by Mid-Continent Supply Company.

*** Indicates 1200-2000 input horsepower.**

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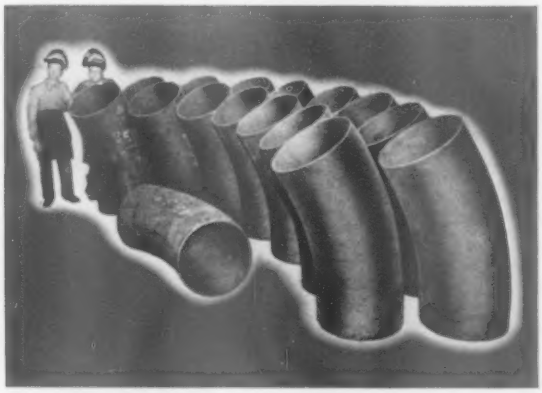
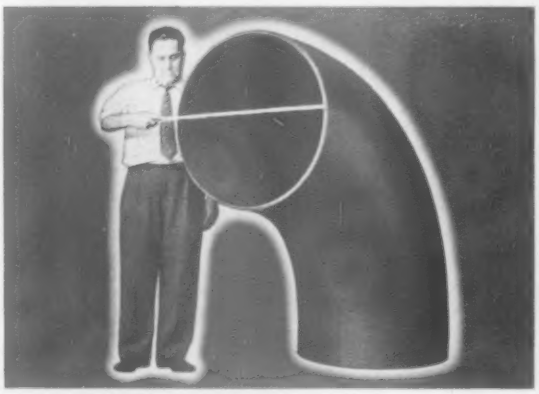
MIDWEST PIPELINE WELDING FITTINGS

SAVE TIME . . . CUT COSTS . . . SOLVE PROBLEMS



CONTOUR ELBOWS

Originated by Midwest and available in 22", 24", 26" and 30" sizes. Angles 10°, 15°, or 30° with 3D radius, providing a long sweep for easy pipe cleaning. 8" tangent at each end removes weld from highly stressed curved section and facilitates alignment. Uniform concentricity permits smaller angles to be obtained by cutting elbow. Available in various wall thicknesses of carbon steel, high yield and low alloy materials. Write for data sheet.

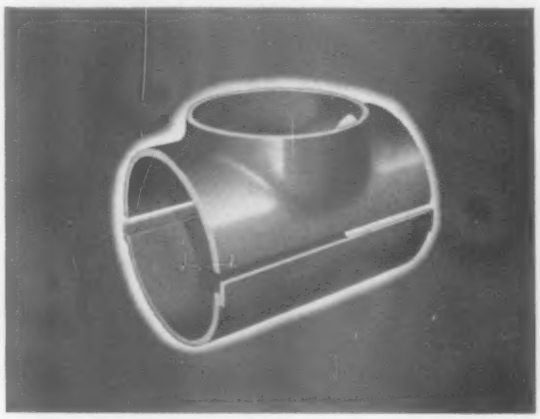


LONG TANGENT ELBOWS

Cost no more than ordinary elbows and are available up to 36" OD in wide variety of materials and wall thicknesses. Tangent at each end equal to ¼ nominal pipe size up to 24" OD—all larger sizes have 6" tangents. These added straight ends save pipe and often eliminate short nipple and extra weld; they remove circumferential welds from point of greatest stress . . . make lining up easier, save time and expense in welding. Write for Catalog 54.

REDUCING ELBOWS

Takes the place of straight elbow and reducer, thus saving one weld, requiring less space and reducing turbulence of flow. Stock sizes available up to 30" OD and in reductions to one-half of large diameter. Being fabricated from plate, it can be made in special thicknesses and materials. Write for data sheets.



WRAP-AROUND SADDLES

"Complete encirclement" type of welded branch reinforcement for making hot taps is available with or without welding strap and from carbon steel or high yield materials. In addition to fitting shown, other types illustrated in Section 8 of ASA B31.1 are available. Write for Data Sheet No. 20.

CAP SADDLES

Reinforcement for nozzle connection into cap. Available in sizes up to 24" on 36" in carbon steel and high yield materials.

Recognizing the fact that conventional welding fittings do not always best meet pipeline needs, Midwest some years ago began the development of special fittings. These are designed for a specific job . . . to save time, cut cost and improve pipelines. The unique Midwest method of manufacture makes the use of special materials easy, economical and permits better delivery . . . it also often enables us to improvise to exactly meet unusual conditions. Write us regarding your requirements.

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DRAWWORKS

Compactness, dependable performance, and ease of maintenance are of utmost importance in offshore drilling. Continental-Emsco, pioneer of many developments in drilling machinery, particularly for offshore, presents the compact, powerful EDE Rig which combines many advantages in a single space-saving package. To insure continuous, uninterrupted service we also recommend companion offshore items by Continental-Emsco, the PJ 27½" Rotary Table, Type L cone roller bearing swivel, and MA Series crown and traveling blocks. Learn why Continental-Emsco equipment is standard practice in many offshore rigs and platforms. For detailed engineering data, call Continental-Emsco today.

Investigate these unusual features

1. A complete and compact unit with 4-speed drawworks.
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3. Totally enclosed pressure lubricated drives.
4. Sixty-inch brake rims with total effective braking area of 2,640 square inches.

* 5. Optional built-in Sandreel.

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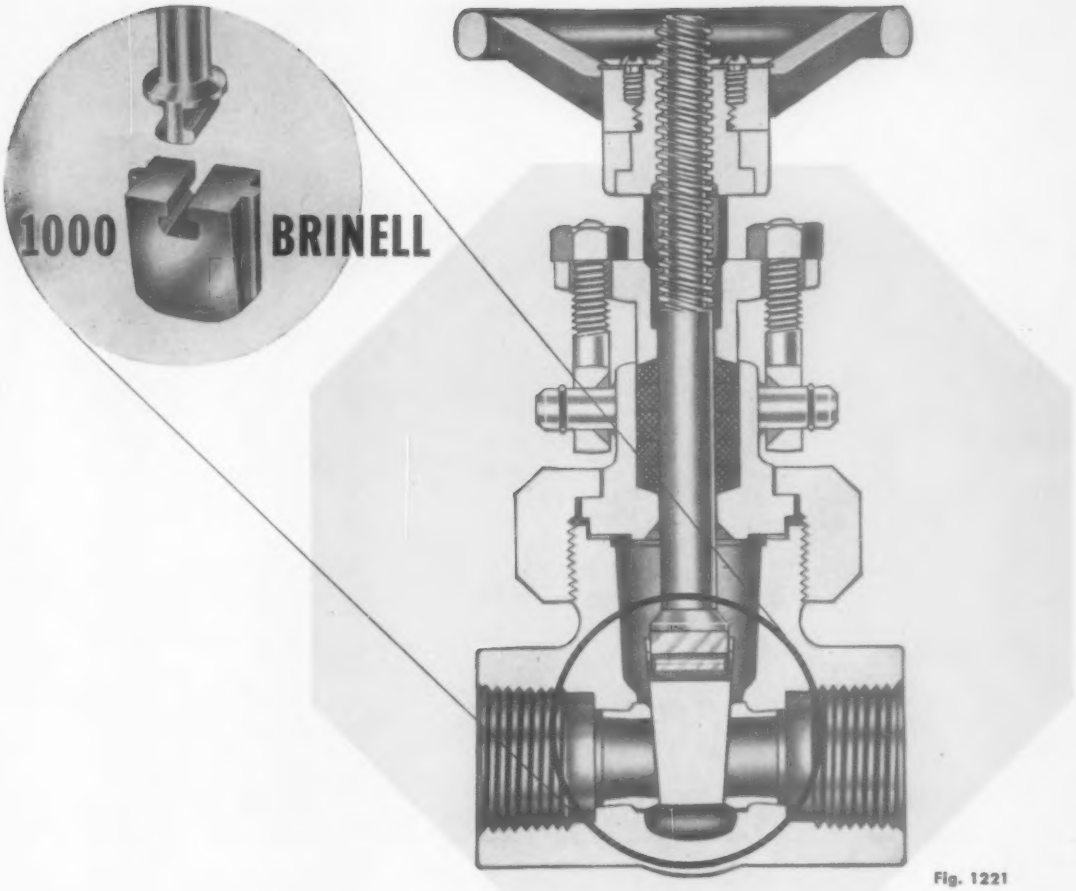

Fig. 1221

Stop Galling with the hardest valve wedges you can buy

OIC VALVES

FORGED & CAST STEEL,
BRONZE & IRON,
LUBRICATED PLUG VALVES

Highly resistant to erosion and corrosion

Here's a wedge as hard as flint . . . so hard that it's undamaged by pipe cuttings, scale or grit. It's the only trim we know of which will successfully withstand the simultaneous attack of the three valve-destroying agents—corrosion, erosion, galling. This wedge is *13% chrome stainless steel hardened up to 1000 Brinell.*

Specify the OIC 1221 gate or 1621 globe where you need the extra rugged nature of forged steel. They are recommended for steam service up to 800°F...oil service up to 1000°F. Or, use these same valves for hydraulic service up to 2000 lbs.

Write for Form 195 for specifications on the OIC forged steel line.

THE OHIO INJECTOR COMPANY
WADSWORTH, OHIO

Wherever You Go In The Oil Country . . .

100% BS&B EQUIPPED LEASE:
1—Series "70" Indirect Heater
2—Model "OGS" Spherical Separators
2—200 bbl. Welded Steel Tanks
BS&B Automatic Controls
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100% BS&B EQUIPPED LEASE:
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100 bbl. Welded Steel Tanks
BS&B Automatic Controls
Safwalk Walkway and Stairway

You'll Find More And More Leases Equipped 100% BS&B!

"One good piece of BS&B oilfield lease production equipment deserves another" . . . that seems to be the trend of thought of an ever increasing number of lease operators these days!

Many of them have tried first one, then another of BS&B's many equipment items . . . heaters, treaters, separators, low temperature separation systems, dehydrators, water knockouts, desulfurizers, tanks, automatic controls, safety heads, etc.

Their complete satisfaction with the equipment in terms of quality, initial cost, maintenance cost, performance and payout time has led them to convert to BS&B *exclusively* on new lease production equipment purchases.

If *you* are planning to put a new lease on production or replace equipment on an old one, take a tip from these profit-wise operators and go 100% BS&B! Better get in touch with your BS&B Man today!

OVER 60 YEARS
BS&B
RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

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Oilfield Equipment Division, Dept. 1-A2A
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Exploration. With the extra traction of its 4-wheel drive, the Universal 'Jeep'* travels remote and rugged lease terrain for prospecting and exploration. In good weather or bad, it takes tools, equipment, geologists, and seismograph crews wherever they need to go.

On the lease...along the pipeline... 'Jeep' vehicles GO "anywhere—anytime"!

The completely new Forward Control 'Jeep' FC-150 Truck. It's the first time a 4-wheel drive truck has so effectively combined so much cargo capacity (74-inch pickup box), with such exceptional "go-anywhere" maneuverability (81-inch wheelbase).

Transportation. The rugged Universal 'Jeep' and 4-Wheel-Drive 'Jeep' Utility Wagon take supervisors, crews, tool-pushers and their equipment and supplies almost anywhere, on the road or off—even through water 2 feet deep or up steep inclines.

Every day the oil and gas industry is more and more depending on the unmatched "go-anywhere" ability of 'Jeep' vehicles to get to more places—do more jobs. The extra traction of 'Jeep' vehicles' 4-wheel drive takes them through mud, sand, soft earth, up steep 65% grades—carrying full loads or towing heavy trailers. And they shift easily into conventional 2-wheel drive for highway travel at top legal speeds.

Time-tested and performance-proved 'Jeep' vehicles are the only vehicles in their weight class designed and engineered completely for 4-wheel drive off-the-road use. And only Willys has so many years of experience and know-how in engineering 4-wheel drive vehicles in this weight class.

These versatile vehicles also supply mobile power. With power take-off, they operate many types of oil and gas industry equipment, from mobile drills to winches.

Rugged 'Jeep' vehicles spread their costs over many jobs... provide additional savings through long life, low maintenance costs and high resale value. Ask your Willys dealer for an on-the-job demonstration today.

The 'Jeep'®

family of 4-Wheel-Drive vehicles

WILLYS...makers of the world's most useful vehicles

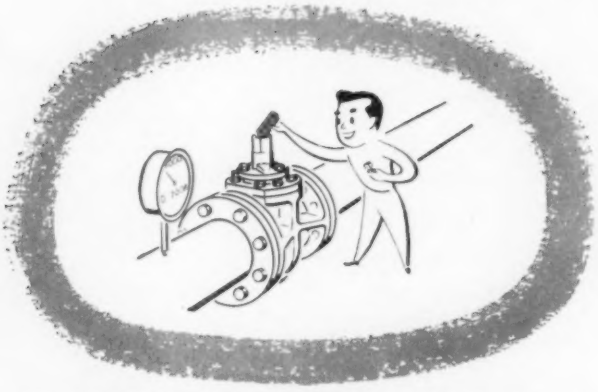
*Model CJ-5 shown

WILLYS MOTORS, INC., TOLEDO 1, OHIO

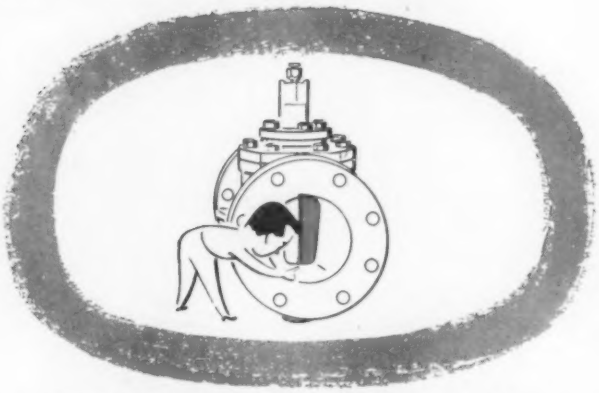
WHAT IS THE ADVANTAGE OF A LUBRICATED VALVE?—The most important advantage of a lubricated valve is that it *seals far tighter* than ordinary valves. The thin film of plastic lubricant forced into the ports of the plug is a pressure seal in itself. And the possibility of seizing or galling is eliminated because the plug can be hydraulically jacked for instant operation. Lubrication is also *preventive maintenance* against down time.

WHAT DOES THE LUBRICANT DO?—In a Rockwell-Nordstrom valve, lubricant is forced through grooves surrounding the plug ports where it acts as a *double seal* against leakage. By hydraulic action, lubricant under pressure also jacks up the plug keeping it free for *instant quarter-turn* operation. And lubrication means that operation is smooth and easy. Finally, lubricant prevents grinding wear for longer valve life at lowest cost.

DOES VALVE LUBRICATION ???



WHAT LUBRICANTS SHOULD BE USED?—Insist on genuine Rockwell lubricants—Rockwell is the largest and most experienced manufacturer of valve lubricants in the world. Rockwell lubricants are the result of years of field experience with nearly every process condition. For many services, there are variations of Rockwell lubricants compounded to offset specific line conditions. See your Rockwell sales engineer or write for Bulletin V-220 for complete details.

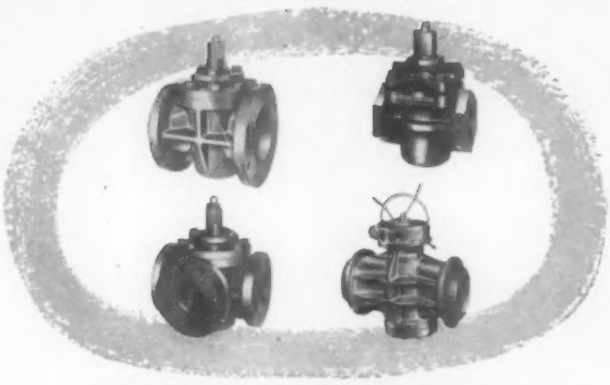


HOW LONG WILL PROPERLY LUBRICATED ROCKWELL-NORDSTROM VALVES LAST?—Many of the first Nordstrom valves put in service are still going strong. In gas distribution installations there are many valves with more than 30 years service. In a two-year paint plant study, Rockwell-Nordstrom valves were the only ones that did not need to be replaced because of leakage. Lubricant assures extra years of perfect service you can't expect from "dry" valves.

ROCKWELL

ROCKWELL-

LUBRICANT SEALED



WILL A ROCKWELL-NORDSTROM VALVE WORK WITHOUT LUBRICANT?—Yes, (even your automobile will function a short while without lubrication) but then the whole advantage of a lubricated valve is lost. Rockwell-Nordstrom lubricated plug valves are made to exceptional standards of tolerance and quality. However, it is their internal lubrication system which raises performance and economy standards far above any other type of valve.

HOW OFTEN SHOULD NORDSTROM VALVES BE LUBRICATED?—Basically, lubrication depends on service-temperature, process, frequency of operation, etc. Genuine Rockwell lubricants actually keep periodic lubrication to a minimum because they are specially compounded to handle specific services. Rockwell lubricant fittings of a button head type make the job fast, easy and every Rockwell-Nordstrom valve can be lubricated in service.

? ? ? COST MONEY OR SAVE MONEY ? ? ?

WHAT ABOUT MAINTENANCE COSTS?—Basically, lubrication is preventive maintenance against wear, replacement and down time costs. Also, lubrication—the key to leakproof, positive shut-off in Rockwell-Nordstrom valves—is an investment in safety and product loss or contamination. It's almost a mechanical axiom that *any* fully lubricated mechanism will require far less repair and parts replacement than a non-lubricated one.

YES, FOR 40 YEARS IT HAS BEEN PROVEN IN EVERY INDUSTRY THAT ROCKWELL–NORDSTROM LUBRICATED PLUG VALVES SAVE MAINTENANCE, REPAIR AND DOWN TIME DOLLARS. LUBRICATION IS AN INVESTMENT IN BETTER SERVICE, LONGER LIFE AND LOWER COST.*

**Note: First cost of Rockwell-Nordstrom valves is about the same—often lower—than ordinary valves.*

Rockwell-Nordstrom valves are available in semi-steel, steel, stainless and corrosion resisting metals and in a *full range* of sizes and pressures. For complete details on Rockwell-Nordstrom valves or Rockwell lubricants, see your supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

Nordstrom VALVES

FOR POSITIVE SHUT-OFF

4 EXCLUSIVE REASONS WHY...

APPLETON

vented Explosion-Proof Fixtures are BETTER!

"FLAME-TIGHT" CONTACT CHAMBER

Exclusive safety chamber prevents explosions even when fixture is serviced with current on! APPLETON *Series AA-51 Vented Explosion-proof Fixtures* offer the positive protection required for hazardous areas.

"FULL-CIRCLE" VENTING

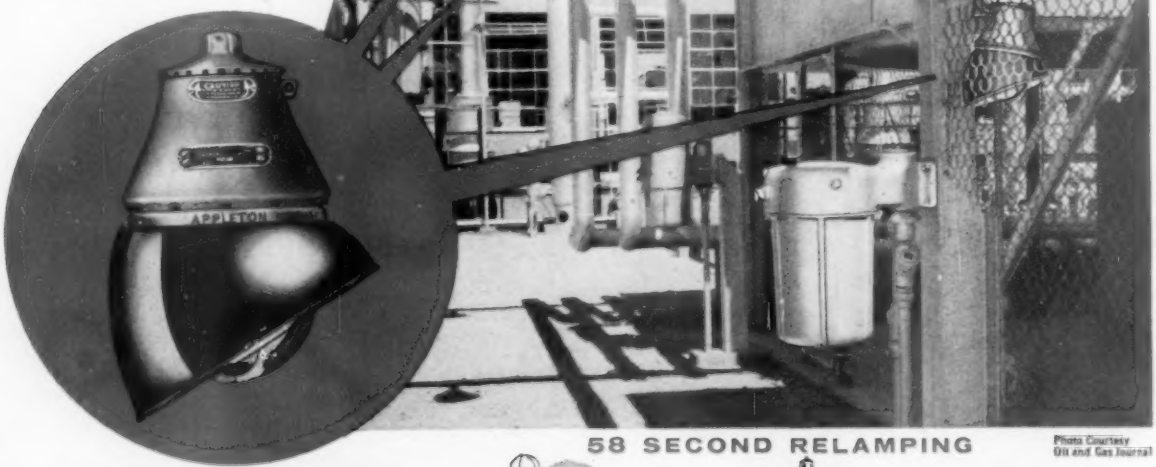
Porous metal interior and specially designed hood dissipate heat evenly and safely . . . keep fixture temperature down, provide longer lamp life.

"INTERCHANGEABLE" UNILET BODY

Standardized diameters at top of Dome Unit Assembly permit interchange with AA-51 fixtures of varying wattages.

plus

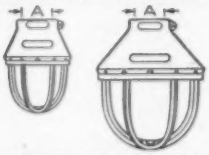
conversion to different wattages or relamping in just *58 SECONDS!* . . . with no loss of man-hours or lengthy shut-downs. Send for complete information today!



58 SECOND RELAMPING

Photo Courtesy Oil and Gas Journal

APPLETON INTERCHANGEABLE UNILET BODY FEATURE



Note how identical diameters "A" on Dome Assemblies allow quick interchange of fixtures with different wattages.

Series AA-51 stand-by units are ready at an instant's notice for relamping . . . with handles attached in advance.

Only a screw driver is needed to change units . . . and **ONLY 58 SECONDS** to climb ladder, change unit and descend!

Cleaning fixtures, changing burned out lamps can safely be attended to at bench . . . preventing costly shut-downs.

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Outlet Boxes

Rely on **APPLETON** *. . . the standard for better wiring*

How to make your automatic heat-treating and hardening even more automatic

...at no extra cost

FAST, continuous operation is the key to profitable automatic forging production lines. Especially in high speed heat-treating and hardening operations. They're extremely sensitive to changes in chemical composition and structure of steel used. Interruptions to make tests or adjustments slow production, increase costs, reduce the advantages of automatic operation. This makes the uniformity of the steel you use an even more vital factor. The more uniform the steel, the steadier the production and the greater the potential you can realize from your automatic equipment.

You can get the utmost in uniformity, and automatic operation—at no extra cost—by using Timken® fine alloy steel. Uniformity is constant from bar to bar, heat to heat, order to order.

We take many extra quality-control steps to assure this uniformity. For example, the Timken Company uses a magnetic stirrer for molten steel to assure equal distribution of alloys, uniform temperature and improved working of the slag. It's the first installation of its type in the United States.

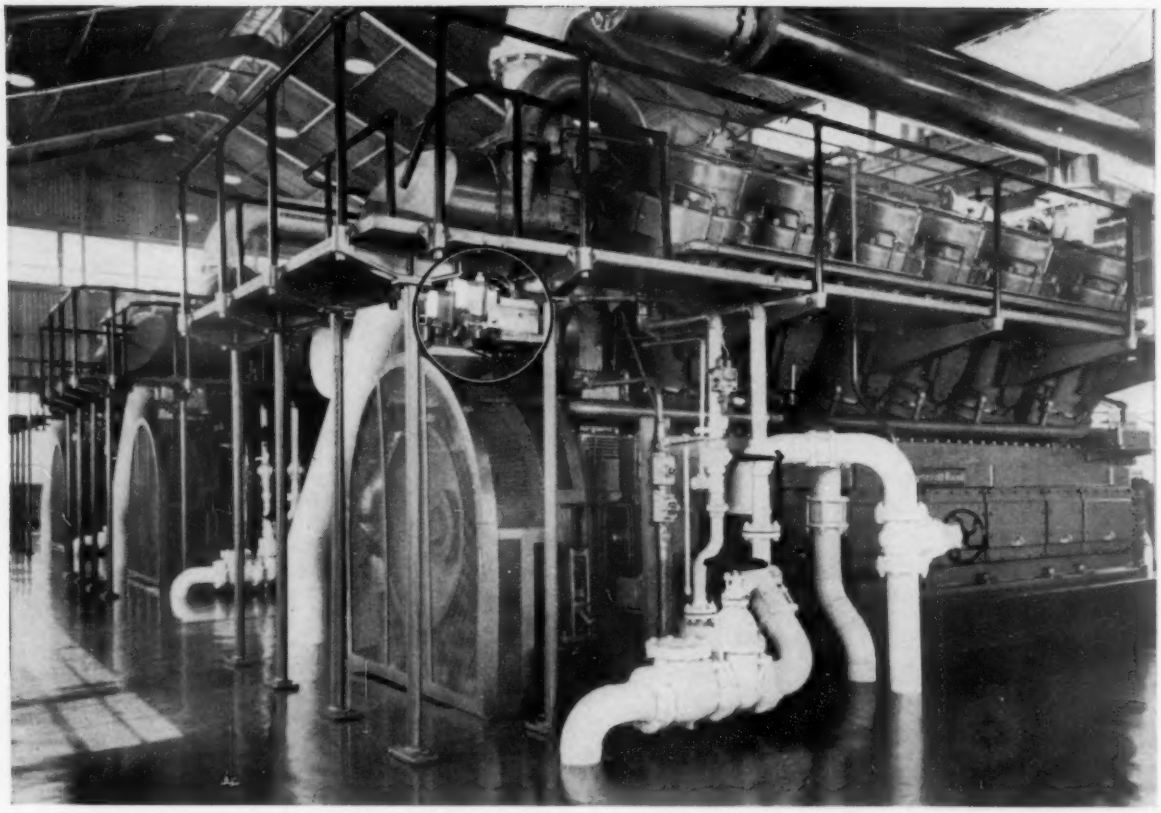
To further assure uniformity, your order of Timken fine alloy steel is handled individually. We target our conditioning procedures to meet your end use requirements. Each bar is stamped to identify the heat it came from. This limits variations within an order as well as from order to order. And every heat is examined spectrometrically to insure uniform grain size.

To make your automatic heat-treating and hardening operations even *more* automatic—at no extra cost—always specify Timken fine alloy steel. You'll get money-saving performance and uniform results every time. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

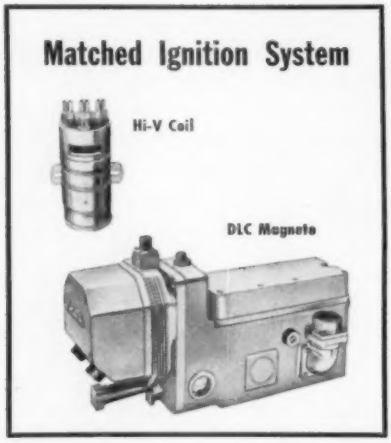
TIMKEN *Fine Alloy* **STEEL**

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING



SERVING TRUNKLINE GAS COMPANY OF HOUSTON —A VITAL LINK IN THE NATION'S ECONOMY!



Trunkline Gas Company of Houston, Texas, operates a natural gas transmission line extending from near McAllen, Texas, to Tuscola in central Illinois where it connects with the line of the Panhandle Eastern Company.

This gas line crosses Texas, Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and the southern half of Illinois —a vital link in the nation's economy.

Helping to serve this very important segment of the nation's natural gas transmission system is the battery of Ingersoll-Rand 412 KVS engines equipped with Bendix DLC6 magnetos and Bendix HI-V transformer coils (illustrated at left) in Trunkline's Cypress Compressor Station near Houston.

The Bendix DLC6 magneto is a completely new type of magneto, incorporating the latest engineering design. Together with the Bendix HI-V transformer coil it becomes a matched ignition system that delivers more than ample voltage with greatly reduced maintenance cost.

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Scintilla Division
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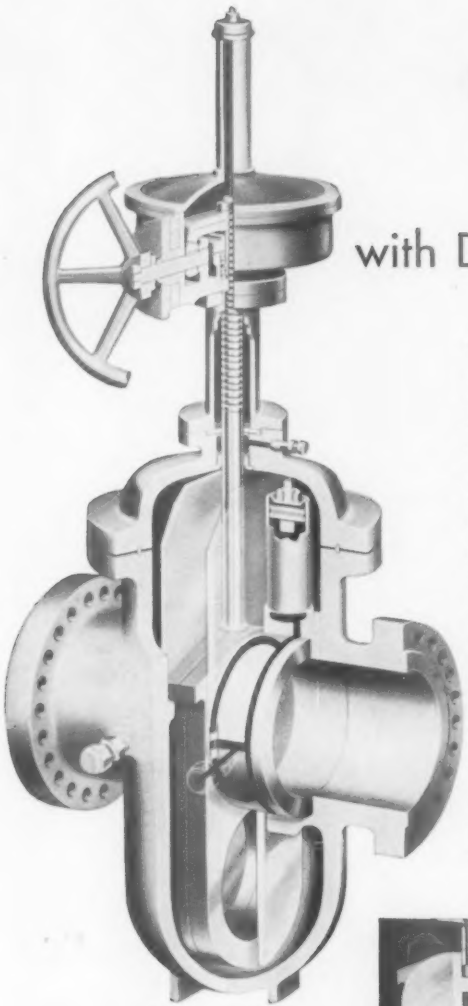
Bendix
AVIATION CORPORATION

NEW ADVANTAGES "GO ON THE LINE"

with DARLING-McEVOY Conduit Valves



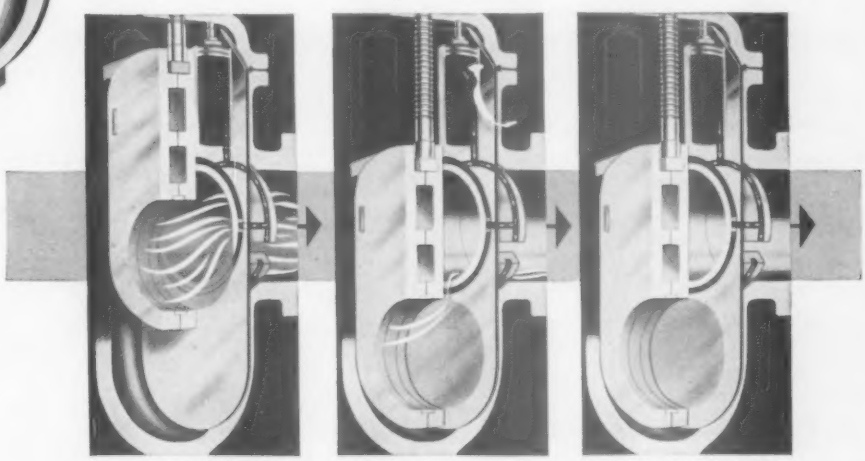
Above: *Cutaway showing heavy, self-aligning gate and parallel seat assembly, with one of the two sealing systems indicated.*

Compare these features with *any* other pipe line gate valve:

1. **EVERY CLOSURE LEAK-PROOF.** No forcing. Positive, automatic self-sealing between seats and gate and seats and body by means of sealing compound.
2. **NON-DIRECTIONAL.** Flow may be in either direction.
3. **TWIN SEALANT RESERVOIRS.** One for each port. Sealant feeds automatically to downstream side only.
4. **NEGLIGIBLE SERVICING.** Leak-proof closure requires very little sealant. Reservoir capacity ample for a great many operations.
5. **SMOOTH, FULL FLOW.** No impediments. No turbulence. No pockets to collect sediment.
6. **REPACKING UNDER PRESSURE.** Construction permits replacement of stem packing media with valve wide open under full line pressure.
7. **EXCEPTIONAL PERFORMANCE AND LIFE.** Self-aligning gates. No wedging. Non-distorting seats, protected when valve is open or closed.

Darling-McEvoy conduit valves, made in 8" and larger sizes, are fully field proved and are now operating continuously on various major lines. For complete information on the self-sealing feature and many other advantages of this unique valve, ask for Bulletin 5402.

Right: *Diagrams of closure action on downstream side of gate.*



APPROACHING CLOSURE... *No loss of sealant as sealing groove in seat is disconnected from reservoir until gate is fully closed.*

CLOSED... *Jumper in gate now permits differential pressure to feed sealant into seat groove to check any remaining flow.*

AUTOMATICALLY SEALED. *Pressures again in balance. Tightness established. No additional sealant used until again needed.*

DARLING VALVES

DARLING VALVE & MANUFACTURING COMPANY

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

Over One Million Feet of...

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HIGH-IMPACT

PVC PIPE

in oil-country use today

This proves that there is no substitute for Kraloy experience.

KRALOY is the most experienced manufacturer of PVC plastic pipe for the petroleum industry. The first polyvinyl chloride lead line installed in this country—at Great Bend, Kansas—was Kraloy Pipe. Kraloy High-Impact PVC today is preferred by production men for maintenance-free service in lead lines and disposal systems. Kraloy customers use Kraloy High-Impact PVC pipe for lead lines, gas lines, and salt water lines because Kraloy normally eliminates (1) sulphur corrosion due to sour crude, (2) paraffin buildup, (3) corrosion and scale, (4) trouble from soil electrolysis.

YOU Benefit From KRALOY'S Quality Control

To insure quality control, random samples of Kraloy Plastic Pipe are tested daily in Kraloy's own laboratory for burst pressure, impact resistance, and tensile strength under standard ASTM specifications.

Kraloy Pipe is Sold Only Through Qualified Supply Stores

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The Mott Company, 1719 McKenney St.

Tulsa, Oklahoma:
The Becker Sales Company, 2837 Sands Spring Rd.

Export:
Latin American Sales & Service Co.,
Court Arcade Building, Tulsa, Oklahoma

For case histories of actual Kraloy installations, cost comparison tables between Kraloy and other pipe, plus detailed instructions and specifications for all field uses, send coupon below for illustrated brochure.

. . . . . .

Kraloy Plastic Pipe Co., Inc., Dept. OGJ-1210
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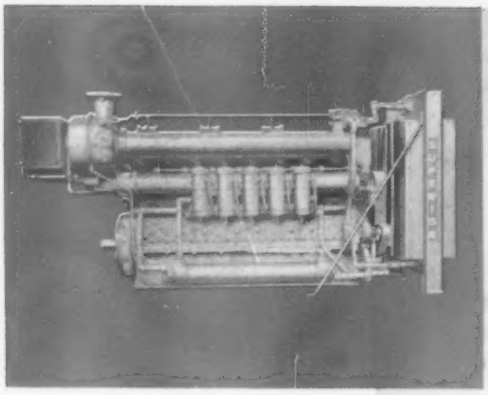
Division of the Seamless Rubber Co., a **Rexall Drug Co.** Subsidiary

KP-101



powered by White's Superior Diesels . . .

SHORELINE'S RIG 7 DRILLS TO SUPER-DEPTHS

Tremendous depths, restricted only by present drill pipe and drilling methods, are reached by Shoreline Drilling Company's new Marine Rig 7, located in the West Delta Area off the Louisiana Coast. For prime power on this isolated Gulf platform, where drilling is being done for the CATC Group, Shoreline wisely chose three White PTDS-8 Supercharged Superior Diesels, each rated at 800 B.H.P.

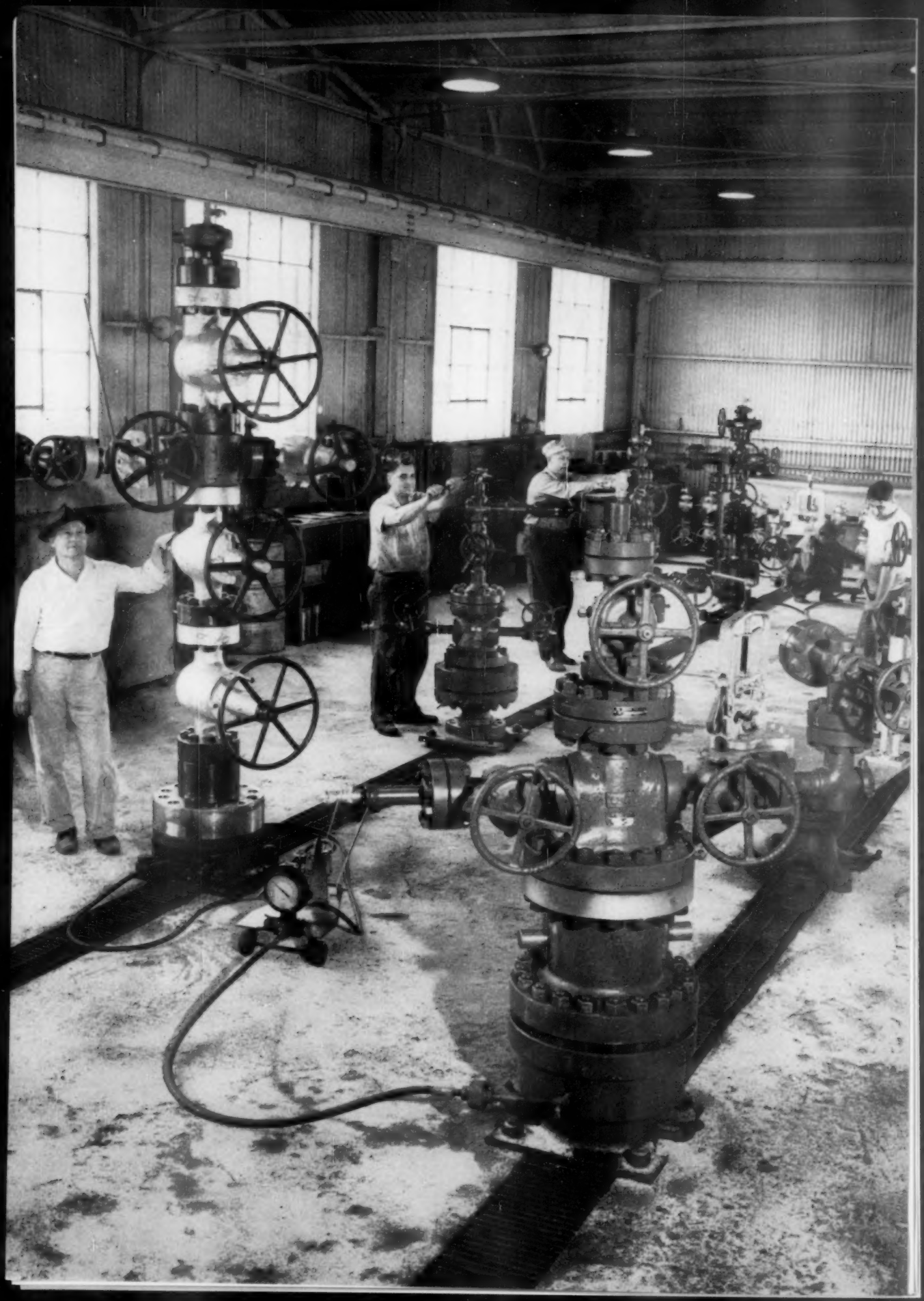
Greater operating economy and dependability with White Diesels assure more profitable and continuous development drilling. Moreover, the up to 30% power increase in the newly improved Super PTD's gives greater working ability, more lugging power and faster acceleration. Yet engine size is not increased, resulting in less weight and less cost per horsepower.

Many other new design and engineering features make White Diesels outstanding for rugged, efficient, low-maintenance service. Superior Diesel, Dual Fuel or Gas oil field engines are available from 320 to 2150 B.H.P. Get the facts from leading rig manufacturers, White Diesel representatives in oil field areas, or the White Diesel Engine Division general office.

White Diesel

WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY

Plant and General Offices: Springfield, Ohio



Proved, Then Proved Again

Costly time is lost, disaster invited when equipment fails in the field. Factory-assembled well control equipment must undergo rugged trials before it is exposed to the rigors of field conditions. It must be proven first in the shop to prove of value in the field.

At one time in the history of a certain tribe in Africa, a male didn't become a full-fledged warrior until he single-handedly killed a mature lion with his spear.

Even today in remote parts of the world, male members of tribes and clans must undergo rugged physical trials, sometimes excruciating pain, to prove their worthiness of wearing the mantle of adult responsibility.

Americans believe in testing, too. Of course, our way of life dictates that we place the emphasis on our "warriors" in a different way. But when they produce something—a new frozen food, an automobile, a rifle, a lawnmower, a BB gun or a new type of wellhead equipment—the product undergoes more rugged testing than any Cherokee brave ever encountered.

No Oil Center Tool Company machinist, engineer or field man has ever killed a lion single-handedly with a spear . . . although a few have popped off some wolves in West Texas and a couple of bull 'gators in South Louisiana.

But these men and their equipment run gauntlets all the time.

The gauntlets are problems encountered by companies and individuals who drill for oil and gas.

And one big reason why O-C-T equipment proves its mettle in the field is because the equipment is proven in the shop first.

O-C-T testing facilities in the Houston headquarters plant simulate field conditions.

That's why when you buy O-C-T you buy equipment that has been proven.

Testing is an important part of all-encompassing O-C-T service.

Whether it's a complete 30,000 pound test Tree, a casing or tubing head, flange, choke or gauge, O-C-T has its own gauntlet to prove the product's mettle.

That's why you install O-C-T equipment with an assurance it will work—for it has worked before.

O-C-T tests all the way down the line.

There are tests for new designs.

There are tests for equipment making its debut and for equipment that has been refurbished.

O-C-T is test conscious.

An O-C-T product goes out of the shop prepared and ready for the biggest test—the field test.

O·C·T

OIL CENTER TOOL CO.

Export Representatives: South America — East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

NEWS OF CHEMICALS FROM **KOPPERS**

"dbpc® antioxidant effectively inhibits gum formation"

says SOCONY MOBIL

Why does Socony Mobil use **dbpc** antioxidant, made by Koppers, in both its regular and premium grades of gasoline? Because **dbpc** gives excellent protection against gum formation in gasolines, yet is easily and safely handled, does not induce tank sweetening, is insoluble in aqueous alkali and is low in cost. The combination of good inhibition and *lack* of detrimental characteristics is helping Socony Mobil achieve good stability at low cost.

dbpc is effective in aviation fuels and anti-knock fluids, too . . . and helps prevent sludge formation in insulating oils and industrial oils.

dbpc has, in some cases, enabled refiners to save money by diverting a portion of their distillates to less expensive and less severe finishing operations. It may help you in this way. Write for complete information. Koppers Company, Inc., Chemical Division, Dept. OGJ-27, Pittsburgh 19, Pennsylvania.

Mobilgas

KOPPERS

KOPPERS CHEMICALS

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TURBINES FOR DEPENDABLE
day-in/day-out
SERVICE

behind every Elliott Turbine...

a nation-wide network of district offices

Call today...

for application engineering

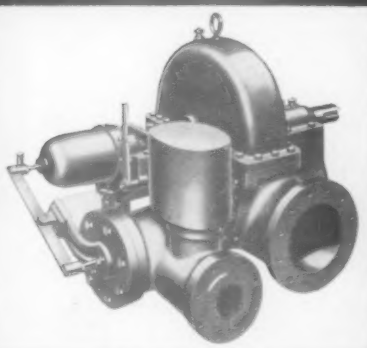
for operating recommendations

for maintenance service

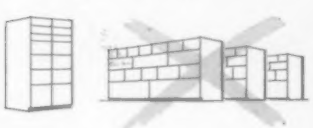
You don't have to wait several days or even weeks for a delayed mail reply or for a turbine service engineer from a distant head office. Near every Elliott turbine installation—and thousands of Elliott turbines are in operation in process industries everywhere—you'll find an Elliott District Office providing *prompt, fast and efficient service.* Time-consuming red tape and complicated approval systems are strictly taboo.

the Elliott man in the Elliott district office is thoroughly trained to furnish designing specifications, application data, and complete costs on Elliott turbines, from the smallest single-stage to large multi-stage types. He is an engineering expert, fully capable of diagnosing your operating difficulties and of planning an effective maintenance program. Call him today.

ELLIOTT Company



The Elliott "Planned Maintenance" Program eliminates need for large costly inventories



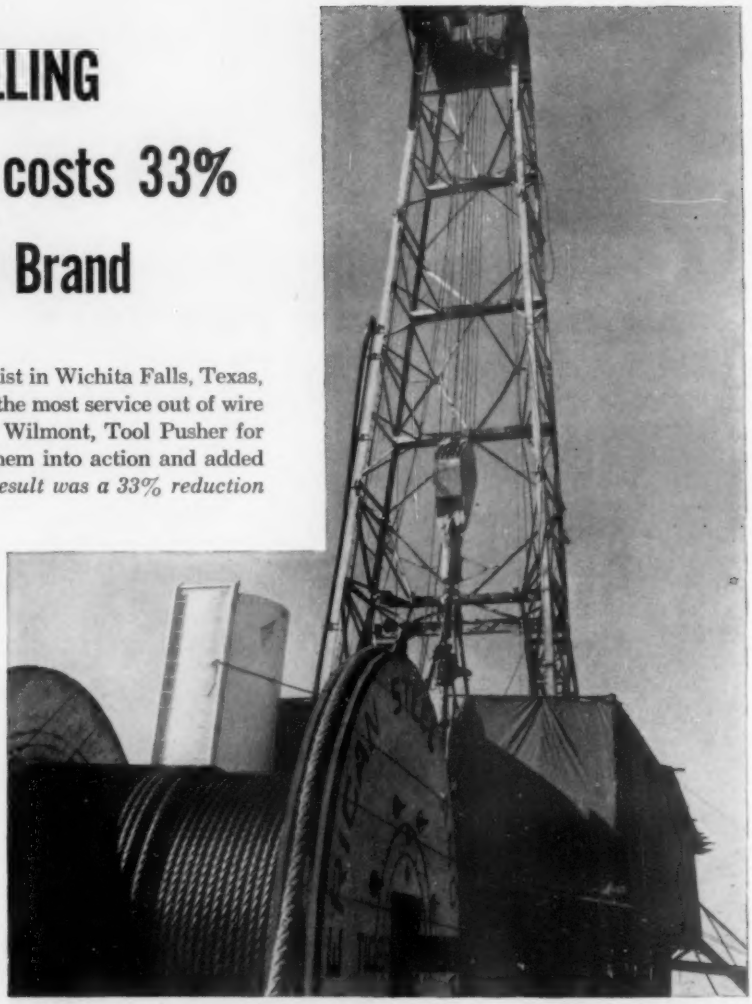
Since YR turbine wearing parts are completely interchangeable, a stock of spares for each turbine is unnecessary. The Elliott field engineer will help you analyze minimum replacement requirements. Ask him for Bulletin H-23, or if you prefer, write Elliott Company, Steam Turbine Department, Jeannette, Pa.

H7-4

Steam Turbines • Motors • Generators • Deaerating Heaters • Ejectors • Condensers • Centrifugal Compressors • Turbochargers • Tube Cleaners • Strainers

COX DRILLING
cuts wire rope costs 33%
with Tiger Brand

The Tiger Brand Wire Rope specialist in Wichita Falls, Texas, had some good ideas on how to get the most service out of wire rope. He discussed them with Ben Wilmont, Tool Pusher for Cox Drilling Company, who put them into action and added some more ideas of his own. *The result was a 33% reduction in wire rope costs.*



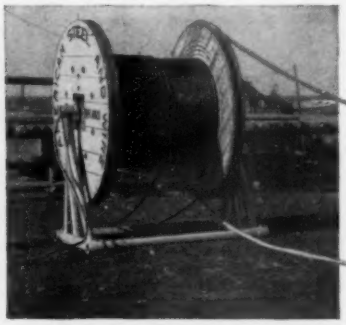
HERE'S WHAT THEY DID—

1. They switched to the widely used Tiger Brand 1⅛" 6 x 19 Excellay Preformed Monitor Improved Plow Steel Drilling Line with IWRC.
2. Increased the length of rope from 3000 feet to 6000 feet.
3. Kept accurate ton-mile records.
4. Cut the rope back at *regular* intervals.
5. Used grooved drums.
6. Took care of the sheaves.
7. Handled the rope carefully. This included rigging up a special cradle for the line in reserve.

Mr. Wilmont says, "According to the ton-mile records, American Tiger Brand Wire Rope is the best we have ever used."

6000 FEET of Tiger Brand Wire Rope were used on the Cox Drilling Company Rig No. 3, Grayson County, Texas. This is double the usual amount.

BILL GILBERT, DRILLER, checking the wear on wire rope.



QUICK REELING SYSTEM. George Whiteside, Floorman, nails V-belts to edge of wire rope reel and uses an endless rope belt driven from a winch. System saves hours of time when moving rig.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed — USS

UNITED STATES STEEL

Meeting the challenge of tomorrow demands advanced designing, engineering and construction methods. It calls for greater investment in superior facilities at home and abroad to produce new and improved processes and techniques. All these are needed to secure and extend the greatest markets of our time.

The REFINERY ENGINEERING Company is meeting tomorrow's challenge *today* with its broadening versatility; its expanding equipment, staff and area of operations. Oil refining, petrochemical and rare earth and ore industries are offered a complete service, from basic research through site selection, design, engineering and construction — *anywhere.* This is backed by ample financial resources to assure on-schedule completion of any project. A discussion of your proposed expansion is invited.

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A DIVISION of VITRO CORPORATION of AMERICA

The REFINERY ENGINEERING Company

NEW YORK TULSA TORONTO

New 111-TA Cementing Unit—best in the field!

MEN *make service!*

BUSTER BRAZEEL

...a man with the POWER!

Take an able, experienced cementer... give him powerful pumping equipment and service facilities to back him up... and you've got an unbeatable combination!

John H. (Buster) Brazeel is a man who packs this kind of power at your well site. Twenty-six years experience and more than 4500 jobs have sharpened his skills. The newest, most powerful equipment in the field is at his command.

Buster operated one of the first power cementing trucks ever seen in the oil patch. Today, when he supervises the operation of one of our latest 111-TA Cementing Units, he's using that equipment in the way to get the job done fastest and *best!*

You benefit every time you rely on this BJ Service-Chemical Process combination—experienced men and the most advanced equipment.

On your next job, why not call on the men who make service—and who know how to use the equipment to make service *best.*

CHEMICAL PROCESS BJ Service

SUBSIDIARY OF BORG-WARNER CORP.

BJ SERVICE, INC.

General Offices and Laboratory—Long Beach, California

Stations Throughout California, Rocky Mountain and Permian Basin Areas

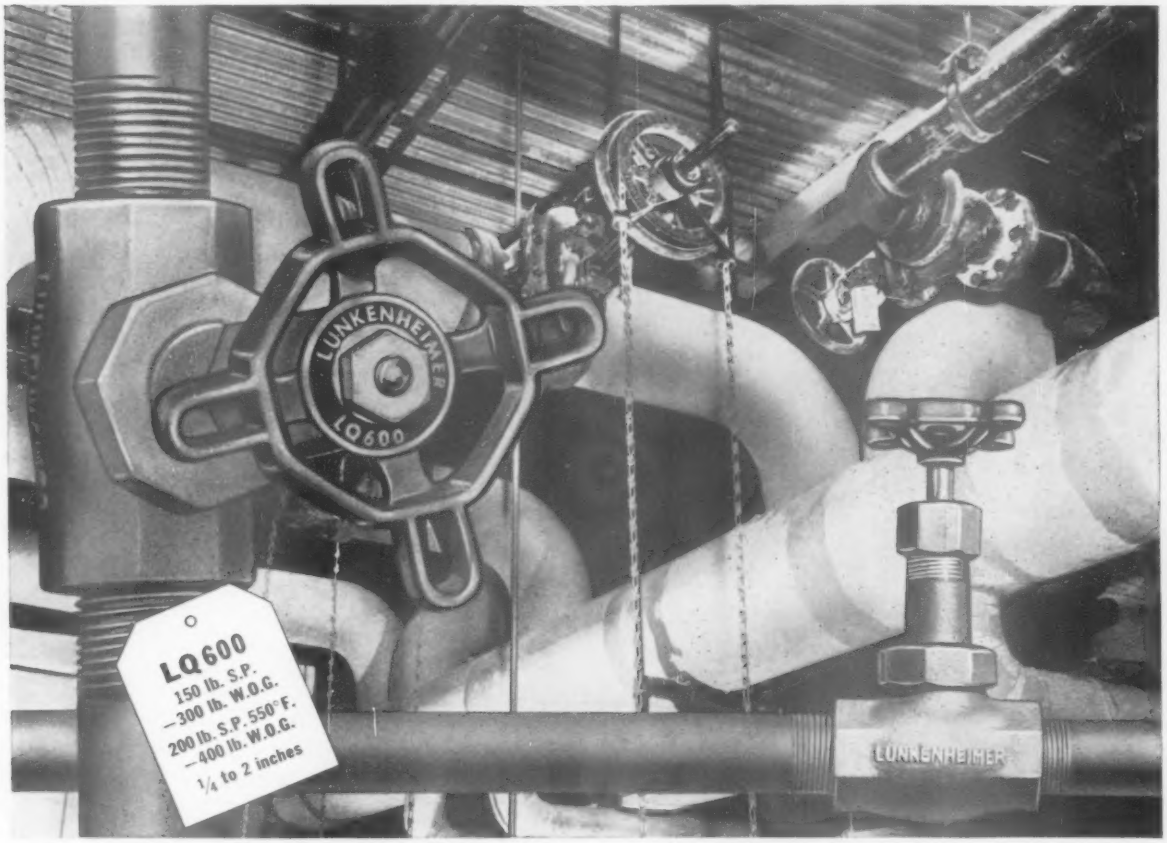
Chemical Process

General Offices and Laboratory—Breckenridge, Texas

Stations Throughout the Mid-Continent Area

Today, maintenance often costs more than the equipment itself!

You Can't Afford Less than the Best



What's happened to maintenance costs? That's a question you hear time and again in management-maintenance meetings these days. Costs are up sky-high and labor rates are still rising. The minute you touch a wrench to a valve, its cost can more than double! You can't do anything about the labor costs, but you can cut maintenance expense to rock-bottom by installing the one bronze globe valve that's handwheel-and-bonnet above all others . . . the LQ600, by Lunkenheimer. Thousands of these valves have served without maintenance for five years and more—many on the toughest throttling services industry can offer. The secret? Exclusive Brinalloy* seats and discs—harder than 500 Brinell Stainless! Insist on LQ600 Valves to help solve your number-one problem . . . sky-high maintenance expense. The Lunkenheimer Co., Box 360, Cincinnati 14, Ohio.

The cost of a LUNKENHEIMER VALVE
Gets smaller... and smaller... and smaller...
with each passing year of dependable service

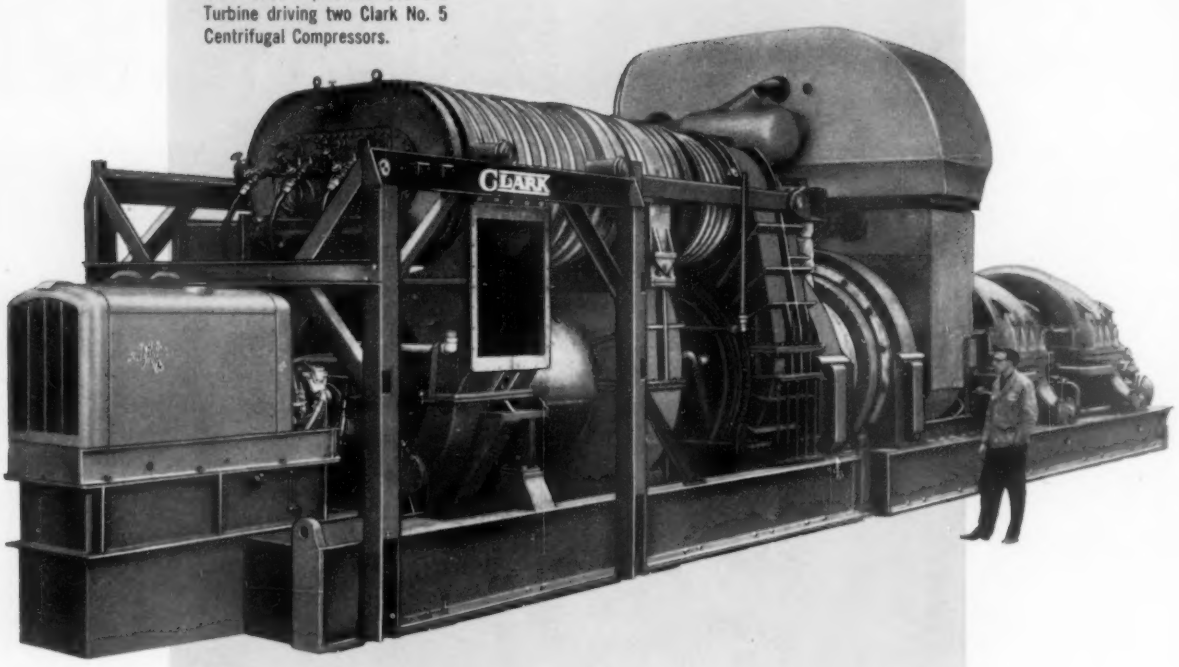
**Patented alloy—T. M. Reg.*

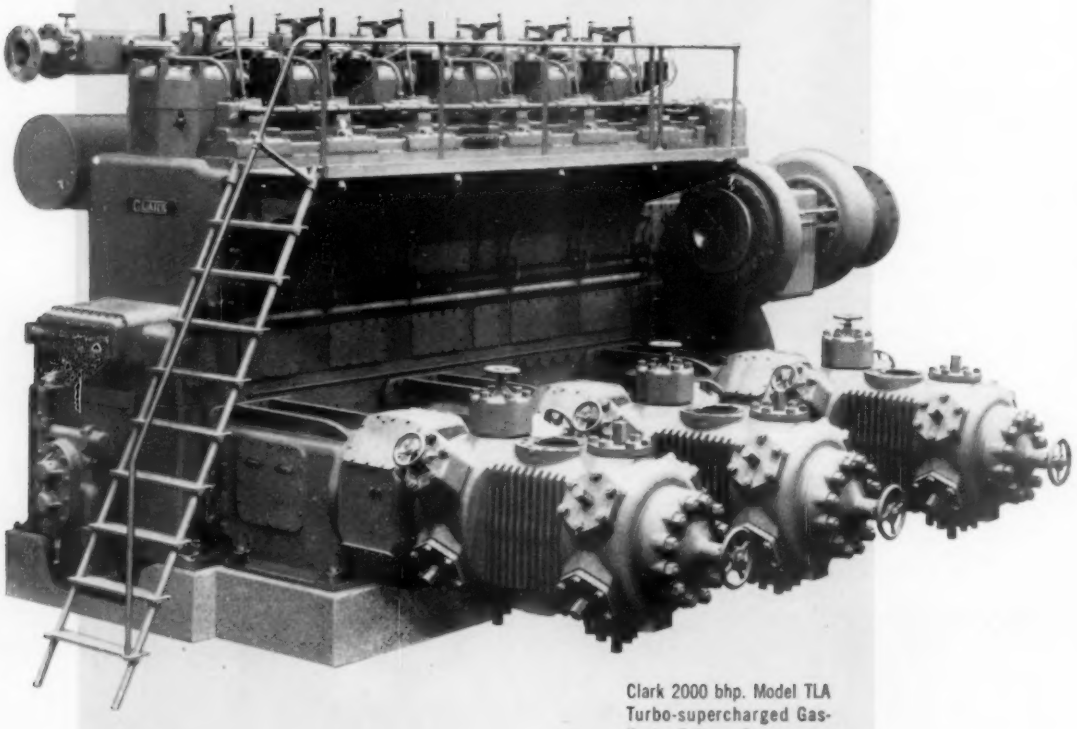
L-157-15

LUNKENHEIMER QUALITY

LUNKENHEIMER®
THE ONE *Great* NAME IN VALVES

Clark 8500 bhp. Model 302 Gas Turbine driving two Clark No. 5 Centrifugal Compressors.





Clark 2000 bhp. Model TLA Turbo-supercharged Gas-Engine-Driven Compressor.

Gas turbines or engines?

With Clark you eliminate

Prejudice

Gas turbine-driven centrifugal compressors or reciprocating compressors... you can get both types from Clark

Prejudice can add substantially to the cost when selecting compressors. At Clark, we build both gas turbine-driven centrifugal compressors and gas-engine-driven reciprocating compressors. In both instances the compressors and drivers are the most modern available.

Our chief concern is to be certain that you obtain the proper unit for your specific installation. This is where our experienced application engineers enter the picture. Both types of units have certain characteristics that may make one or the other best for your particular use. An unbiased opinion, after a careful examination of all the facts and conditions, is vitally important. Clark is the only company that can give you an unbiased opinion because Clark is the only company that builds reciprocating and centrifugal compressors in addition to gas turbines.

Clark application engineers will be pleased to help you determine the right type of compressor and driver combination for your next application.

CLARK BROS. CO., OLEAN, NEW YORK

One of the Dresser Industries

Offices in Principal Cities Throughout the World

CLARK®

Centrifugal Compressors
Reciprocating Compressors
Gas Turbines

fracture with Adomite

Well	Formation	Gallons Fracturing Fluid	Pounds Sand	Injection Rate BPM	Production, BOPD Before	After	30-60 Days After	6 Months After
A.	San Andres	10,000	10,000	5	2	28	35	—
B.	San Andres	15,000	21,000	5	4	54	120	65
C.	Springer Sand	6,000	12,000	3	8	49	51	51
D.	Penn. Cgl.	6,000	6,000	4	*	345	144	80
E.	Miss. Chat	6,000	12,000	10	Dead	435	306	192
F.	Miss. Chat	6,000	10,000	5	10	—	33	30
G.	Miss. Chat	6,000	12,000	10	*	—	330	360
H.	Clear Fork	10,000	20,000	6	*			51
I.	[illegible]							52
J.								99
K.								51
L.								68
M.								30

GET RESULTS LIKE THESE

Adomite®— and only Adomite does so many things so effectively

Seals the fracture face . . . minimizes fluid loss . . . no damage to formation.

Longer fractures . . . deeper penetration of sands.

Fewer sandouts . . . reduces fluid loss in rock matrix, prevents buildup of sand concentrations in the fractures.

Saves you money . . . utilizes your own lease crudes . . . saves transportation costs.

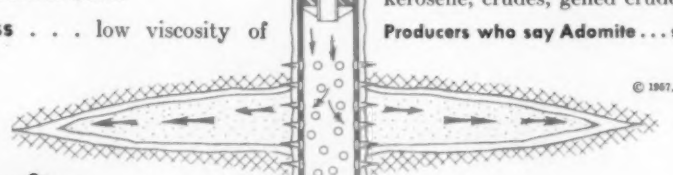
Decreases friction loss . . . low viscosity of Adomite-created fracturing fluids permits use of less pumping equipment than with viscous refinery residuals.

Reduces hazard of emulsions . . . emulsion-breaking characteristics are an important consideration to many producers.

Adaptable to virtually all types of crude, Adomite is all you need to control fluid loss of kerosene, crudes, gelled crudes or refinery residuals.

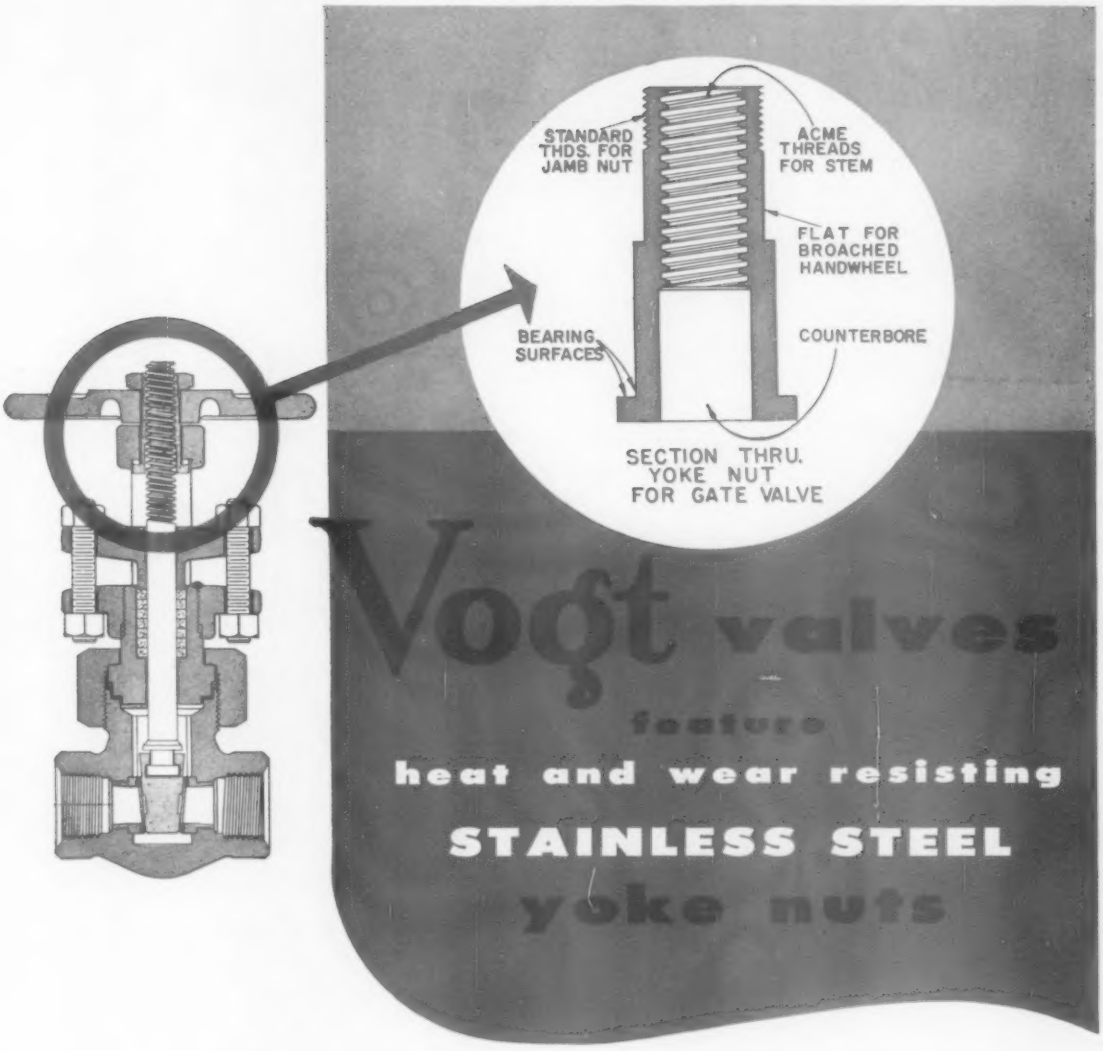
Producers who say Adomite . . . stay with Adomite.

© 1957, Continental Oil Company



Get greater profits from your next fracturing job

TELL YOUR SERVICE COMPANY TO USE Adomite



Heat and wear-resisting *stainless steel* yoke nuts in Vogt Valves give longer trouble-free service. We have proved this in our own "Torture Chamber," under constant and accelerated testing, as well as in tough service applications. They are made from a special stainless steel alloy having excellent bearing quality, matchless strength, and a melting point of approximately 2700°F.

The rotating gate valve yoke nut design, illustrated, has flats for a tight fit with the square broached hole of the handwheel. Non-rotating yoke nuts, for globe and angle valves, are of the same superior design and quality. Vogt GP Valves are available in a complete range of sizes from ¼" to 2" and rated 800 pounds at 850°F. and 2000 pounds at 100°F.

Adv. No. 6 in a series describing the features of Vogt GP Valves.

Write For Your FREE COPY of Supplement No. 1 to Catalog F-9. Address Dept. 24A-FO.

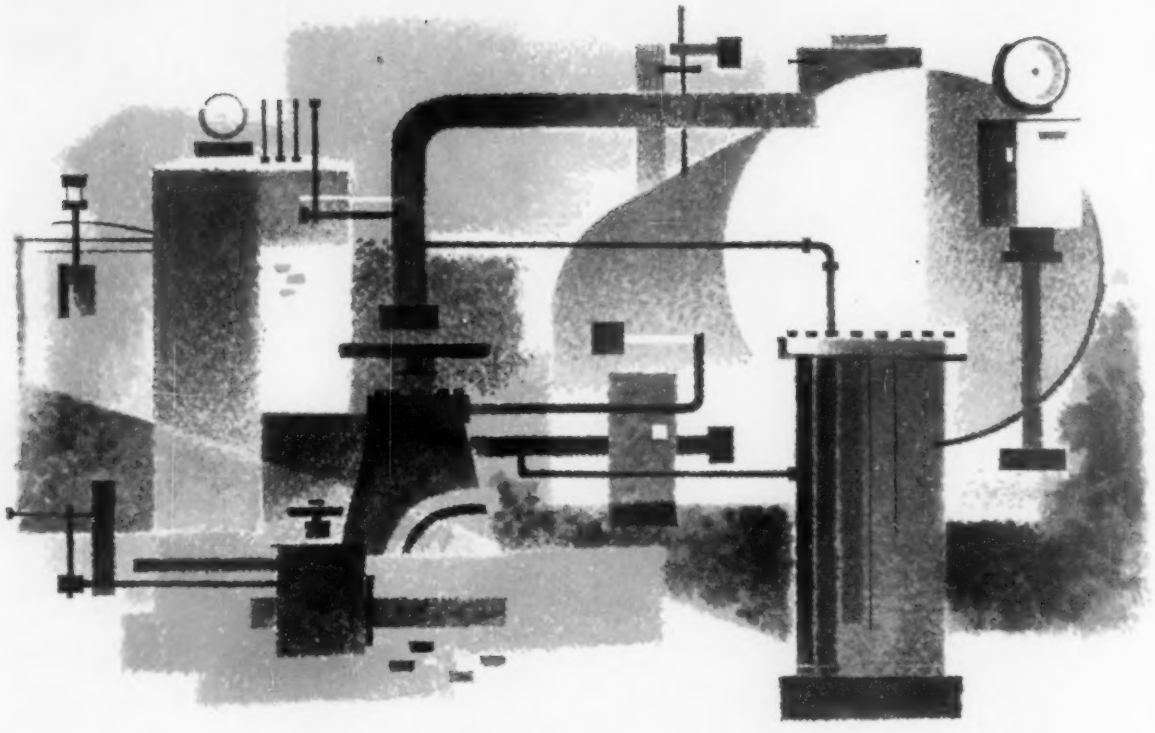
HENRY VOGT MACHINE CO.
P. O. Box 1918—Louisville 1, Ky.

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Philadelphia, St. Louis, Charleston, W. Va., Cincinnati.

Vogt GENERAL PURPOSE GP Vogt FOR BETTER VALVES

DROP FORGED STEEL

VALVES



How ALCOA Activated Alumina

—controls internal pipeline corrosion

—prevents water contamination of petroleum products

for a major oil company

Operating experience has proved the necessity and advisability of using dehydration on petroleum product pipelines . . . to control internal corrosion and to eliminate, insofar as possible, many problems relating to delivery of products contaminated by water to pipeline terminals. Here's how a major oil company does it:

The drying plant consists of four towers, 20 feet high by 8 feet in diameter, each charged with 18,000 pounds of ALCOA® Activated Alumina. The desiccant is supported by a neutral aggregate bed which rests on a screen supported by a large mesh grating.

Two towers are on stream for 24 hours, and are then regenerated while the other two are put on stream. Each tower dries 25,000 barrels of petroleum products during its 24 hours of service.

Reactivation is accomplished by draining the tower and feeding 150-pound steam into fin type coils which are spaced evenly through the bed of alumina. When the bed is drained, vacuum is pulled on it by a steam jet eductor. Regeneration is complete when the alumina reaches a minimum temperature of 350°F, by which time the vacuum has reached 26 inches or more.

ALCOA Activated Alumina is the "old reliable" desiccant of the oil and gas industry. If you're not already using it, investigate today. Write to ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 715-B Alcoa Building, Pittsburgh 19, Pa.

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TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

ALCOA
CHEMICALS
ALUMINUM COMPANY OF AMERICA

here's why Baash-Ross

DRILL COLLARS

are superior...

Precise machining—API specifications exceeded.

High physicals developed by carefully controlled heat treats.

Rigid inspection during every phase of manufacturing.

Restricted analysis of the steel using only the best of fine grain high alloys.

Accurately centered circulation hole assures better rotational balance and permits instruments to pass without binding.

For further information write P. O. Box 1348, Houston 1, Texas or see The Composite Catalog.

BAASH-ROSS Drill Collars are the top choice because specialized manufacturing techniques have been developed and perfected which are unsurpassed in the industry. Buy the best—in drilling and production tools—buy BAASH-ROSS.

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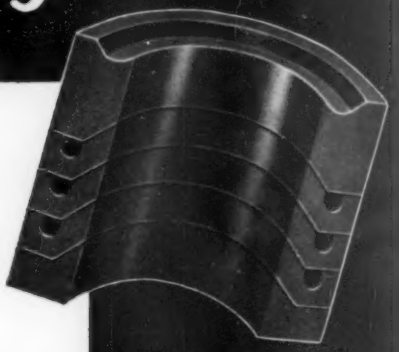
Keep slush pumps working

. . . with J-M WILDCAT packing

it's engineered for the job

- Lasts longer
- Seals tighter
- Lengthens rod life
- Easy to install

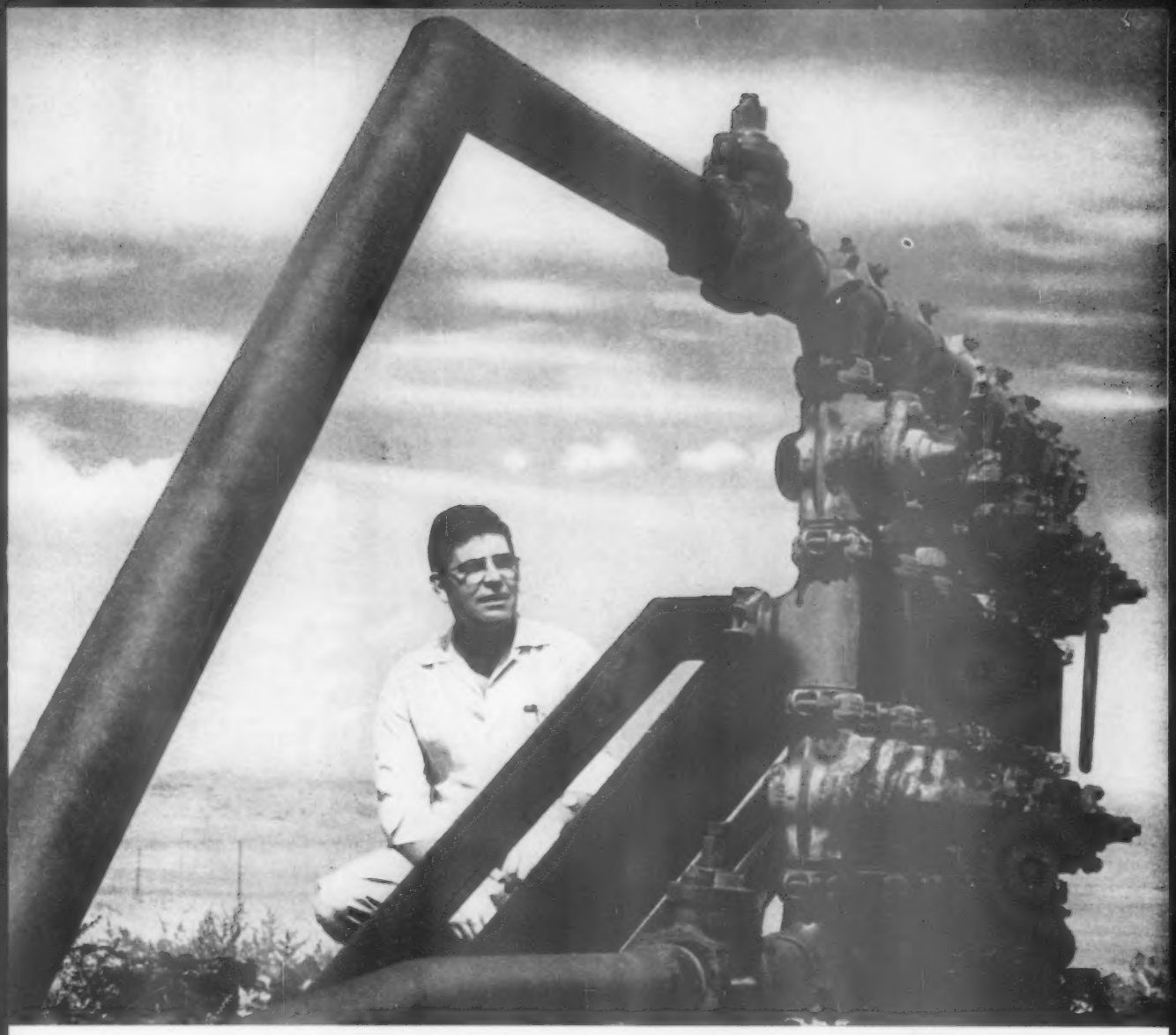


Cutaway shows how Wildcat Sealing Rings are designed for highly efficient performance with low rod friction.

See it at your field store

Look for counter-card display with actual sample of J-M Wildcat Packing attached. Or write for folder PK-77A. Johns-Manville, Box 14, New York 16, N. Y. In Canada, 565 Lakeshore Rd. East, Port Credit (Toronto), Ontario.

Johns-Manville PACKINGS & GASKETS



Beth-Co-Weld is ideal pipe for gathering systems, such as this at Hamilton Dome Field, near Thermopolis, Wyo.

You Play It Safe with Beth-Co-Weld

Wherever there's need for pipe—whether for lease-gathering systems, gas-distribution systems, service lines on the rig, or general maintenance work—you play it safe when you use Beth-Co-Weld steel pipe.

Beth-Co-Weld is a quality pipe in every way. It's sound and long-lasting, and made from the most suitable grade of steel for the purpose. It was one of the first fully accepted types of continuous-weld line pipe.

You can get Beth-Co-Weld from the nearest Bethlehem Supply store. You'll save time, too, for chances are good that they can supply you from stock.

WITH BETH-CO-WELD YOU GET:

1. Pipe furnished to API Specification API 5-L. Also ASTM Specifications A-120 and A-53. Comes either coated, mill-wrapped, or uncoated for field-wrapping.
2. Black and galvanized pipe from ½ in. nominal to 4½ in. OD, in standard weights. Sizes from ½ in. through 3 in. nominal are also furnished in extra-strong weights.
3. Pipe in sizes 3½ in. and 4½ in. OD in weights lighter than standard.
4. Single mill lengths. Also double mill lengths up to 50 ft for sizes 1½ in. through 4½ in. OD.
5. Ends furnished in these styles: threaded-and-coupled; plain-end-beveled for welding; also plain-end-square-cut, grooved for ring-joint coupling.

BETHLEHEM SUPPLY COMPANY

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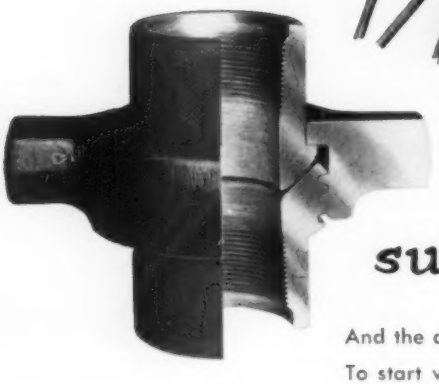
West Coast Headquarters: Los Angeles, Calif.
Export Distributor: Bethlehem Steel Export Corporation
25 Broadway, New York, N. Y.

BETHLEHEM SUPPLY



"I didn't realize there was such a difference in unions!"

And the difference is quite obvious when you compare Weco with other unions.

To start with—Weco's exclusive ball and cone seat design gives you the most perfect sealing possible. The spherical surface of the male sub seats on the conical surface of the female sub forming a positive, leak-proof seal. The sturdier construction of Weco Unions takes the most punishing service as part of a regular day's work. The Acme threads permit faster, easier make-up and break-out, day after day, without damage or distortion.

These differences in the design and construction of Weco Unions pay dividends in longer life and superior sealing service.

Ask for Weco Unions at supply stores everywhere. They are available in the exact size and pressure required for all oil country connections.

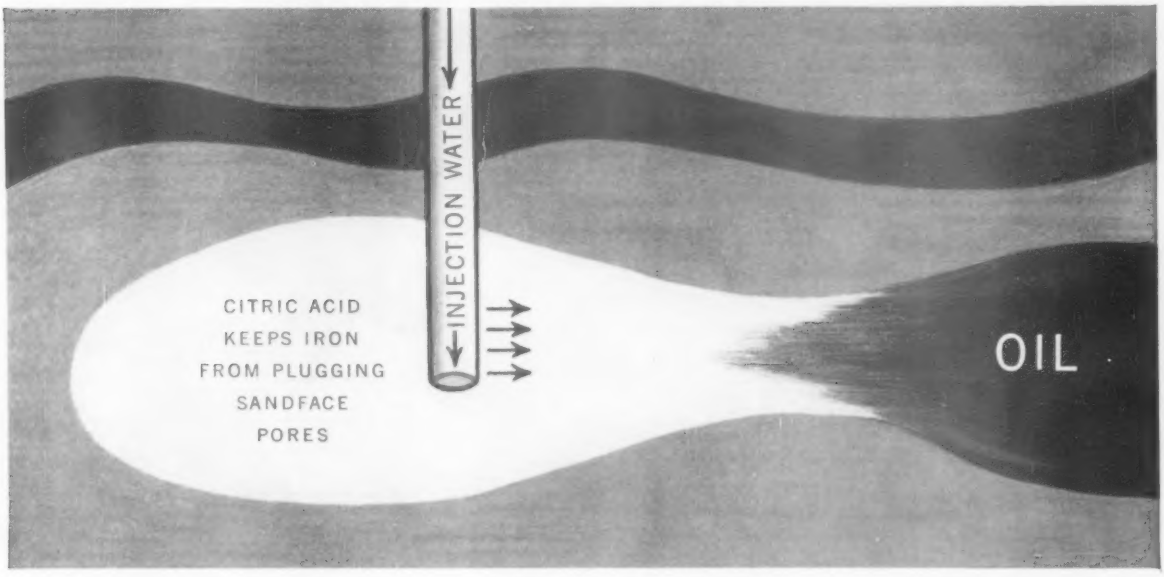
U-8-56

WECO®

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION

Improve flow rates in secondary recovery



Add CITRIC ACID to injection water

● When you add citric acid to injection water you prevent the formation of iron precipitates which plug the sandface, restricting the flow rate. This means that you reduce the need for temporary (and sometimes costly) methods of freeing iron-plugged wells.

Also important, citric works even in high calcium waters. Citric preferentially sequesters the iron and keeps it soluble. Other ions do not interfere.

Pound for pound, citric acid sequesters iron better and at less cost than any other agent. It's nontoxic and safe to handle, too.

Pfizer supplies huge amounts of citric acid for a multitude of industrial uses throughout the world. This large volume production assures you of receiving all the citric you need without delay. For further information on preventing injection well plugging with Pfizer Citric Acid write to:

CITRIC ACID ADDED
In this bottle, only 10 ppm of Pfizer Citric Acid has been added to brine containing 2 ppm iron.

NO CITRIC ADDED
The brine in this bottle also contains 2 ppm iron. But no citric has been added.

CHAS. PFIZER & CO., INC., Chemical Sales Division
630 Flushing Ave., Brooklyn 6, N.Y.
Branch Offices:
Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.; Dallas, Tex.

Manufacturing Chemists for Over 100 Years

Pfizer

No problems here !

Excellent weldability, plus uniformity in diameter, concentricity and end finish, make Kaiser Steel Line Pipe easy to weld in the field.

This means more pipe can be laid per day.

Next time you are ordering line pipe, specify Kaiser Steel Line Pipe.

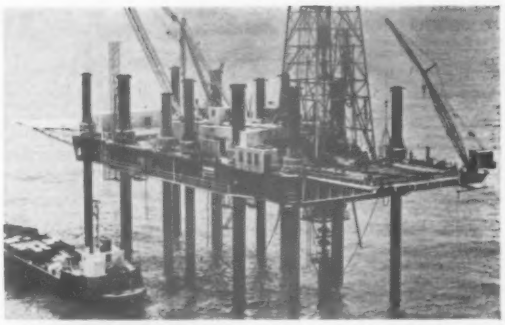
Rely on Kaiser Steel quality and service to add dollars to your operating profits.

Kaiser Steel

VISUAL WELD INSPECTION ON PACIFIC NORTHWEST PIPELINE.

Steel Mill Products: plates • hot rolled strip and sheet • cold rolled strip and sheet • tin plate • continuous weld pipe • electric weld pipe • alloy and carbon bars • bar shapes • structural shapes semi-finished steels • pig iron • ingot molds • coke by-products • **Fabricating Division:** steel fabrication for construction, aircraft, missile and other industries • expanded fusion weld pipe reinforced concrete pipe • tanks • For specifications, write: **KAISER STEEL CORPORATION** • **Los Angeles** • **Oakland** • **Seattle** • **Portland** • **Phoenix** • **Denver** • **Tulsa** • **New York**

on shore . . .



or offshore

your own painter can
"COLD GALVANIZE"
any steel surface with...

DIMETCOTE

* the 100% inorganic zinc coating

any **PLACE**

any **TIME**

any **WHERE**

Dimetcote is absolutely unique. It is not a paint, it contains no oils, resins or any other organic materials, yet it can be applied by spray or brush. When Dimetcote is applied to steel, a reaction takes place at the surface which produces chemical bonding as well as physical adhesion. It is almost impossible to find the interface between Dimetcote and the steel.

Dimetcote has many unusual characteristics. It shows no visible change after more than ten years exposure to the most severe weather conditions – sun, heat, fresh and salt water. It is insoluble in all solvents and petroleum products. It is highly abrasion resistant, but if abraded through to bare steel, the coating will cathodically inhibit corrosion.

Now tanks and structures can be given the same protection that galvanizing affords, *plus salt water resistance*. Existing structures need not be dismantled and new structures can be coated either before or after erection. *Only one coat* of Dimetcote over a sandblasted surface is required to protect such structures as:

Tank Exteriors • Cargo Tanks in Tankers • Dam Gates • Structural Steel • Christmas Trees • Buoys • Floating Roof Tanks • Offshore Rigs • Water Tanks • Barges • Ship Decks • Stacks

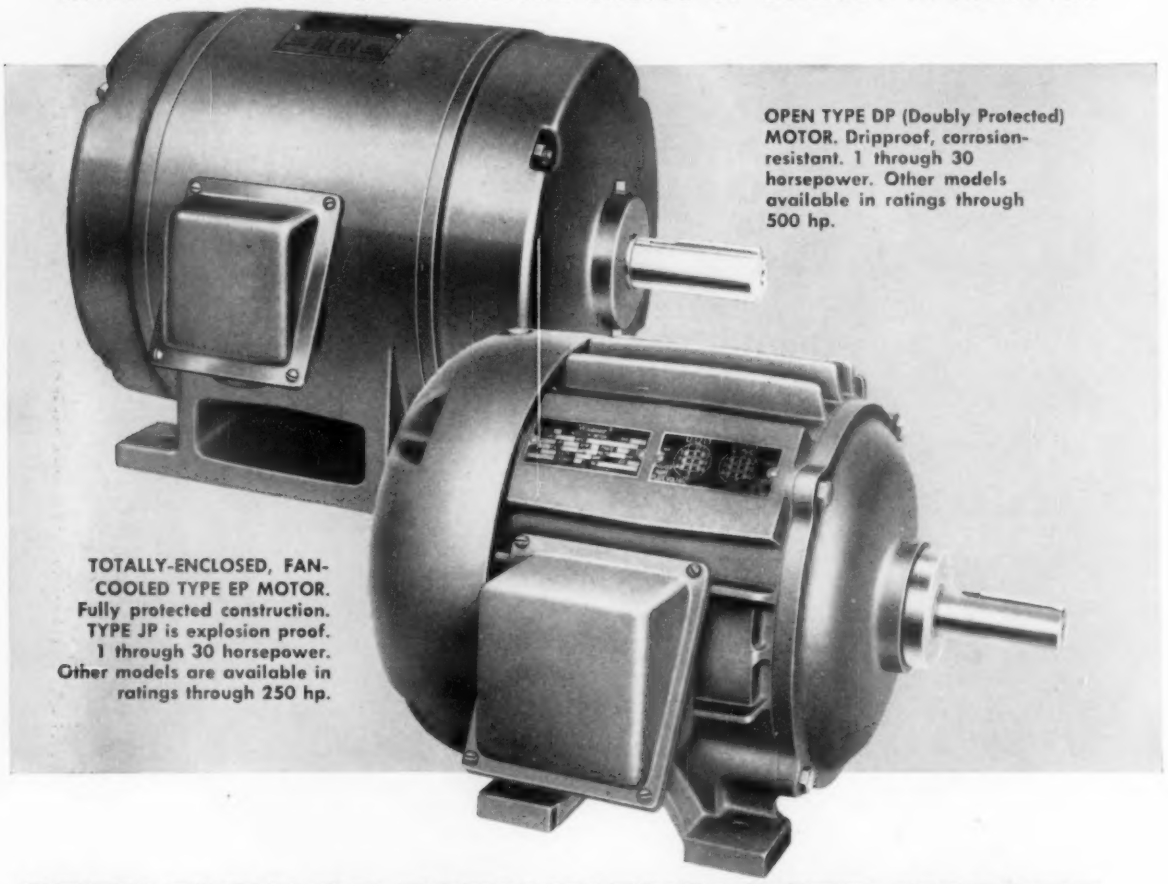
AMERCOAT CORPORATION Dept. CB
4809 Firestone Blvd., South Gate, California
Please send illustrated folder on Dimetcote

Name_____
Title_____
Company_____
Address_____
City_____ Zone___ State_____

Amercoat® CORPORATION
4809 Firestone Blvd., South Gate, California

921 Pitner Avenue, Evanston, Illinois
360 Carnegie Avenue, Kenilworth, New Jersey
2404 Dennis Street, Jacksonville, Florida
6530 Supply Row, Houston, Texas

WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY



OPEN TYPE DP (Doubly Protected) MOTOR. Dripproof, corrosion-resistant. 1 through 30 horsepower. Other models available in ratings through 500 hp.

TOTALLY-ENCLOSED, FAN-COOLED TYPE EP MOTOR. Fully protected construction. TYPE JP is explosion proof. 1 through 30 horsepower. Other models are available in ratings through 250 hp.

OPEN TYPE OR TOTALLY ENCLOSED MOTORS...

Wagner offers MORE for your motor dollar!

- **MORE POWER IN LESS SPACE** . . . These motors are built in NEMA frame sizes 182 through 326 U. They pack more power into less space for easier handling and stocking—require less space for installations.
- **CORROSION-RESISTANT FRAMES** . . . Both types are built with rugged, corrosion-resistant cast iron frames. Motor feet are cast as an integral part of the frame for maximum strength and rigidity.
- **THE TYPE OF PROTECTION YOU NEED** . . . Type DP motors have completely dripproof—virtually splash-proof enclosures; while type EP is totally enclosed, fan-cooled for complete protection; and type JP adds explosion proof features.
- **COOLER OPERATION** . . . Special baffles direct a cooling flow of air through the DP motor. Types EP and JP are fan-cooled and have ribbed frames to increase the surface area for more efficient cooling.
- **LONGER BEARING LIFE** . . . These motors can be re-greased when desired to prolong bearing life. Fresh grease can be added—old grease removed through openings provided in the bearing housing.
- **WAGNER DEPENDABILITY** . . . These two motors have the same high Wagner quality, will give the same long life performance, that have made Wagner Motors a known value for sixty-five years.
- Let a Wagner field engineer, expert on motor applications, show you how these motors can be applied to your needs. Call the nearest of our 32 branch offices, or write us. Bulletins MU-202 and MU-203 give complete information on these Wagner Motors. Write for your file copies today.

M57-4

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6389 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

W-K-M® PRODUCTS

are used wherever oil and gas are produced, transported or processed

W-K-M Production Valves

W-K-M Pipeline Valves

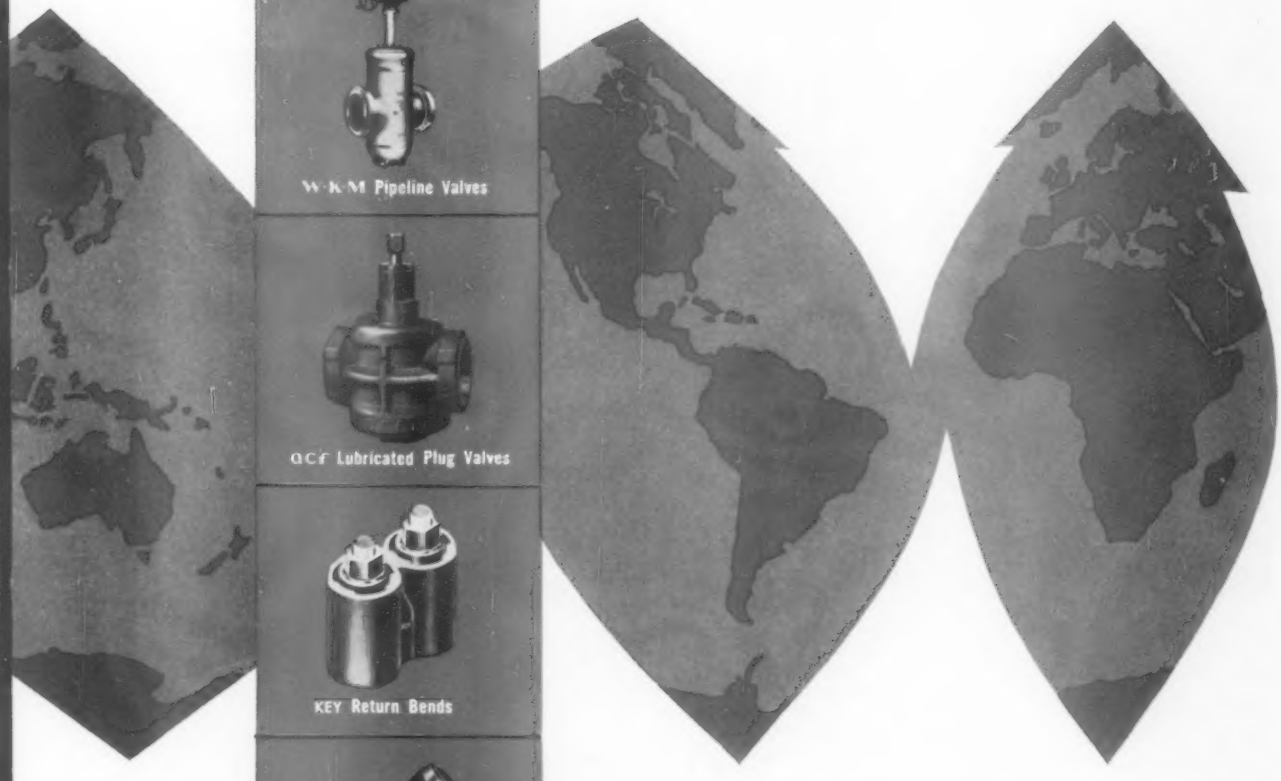
acf Lubricated Plug Valves

KEY Return Bends

KEY-KAST Fittings

W-K-M/AVION
Automatic Well Tester

W-K-M/AVION
Automatic Custody
Transfer Control System



W-K-M products have distinguished themselves for long, efficient life, and lower maintenance on wells, pipelines, in refineries and in petrochemical plants all over the globe.

This reputation for long-lasting, trouble-free performance, results from advanced research and engineering, combined with constant quality control in one of the world's most modern plants.

Ask your **W-K-M** Representative for full details of the many advantages provided by **W-K-M** products in your operations.

5624

W-K-M

DIVISION OF acf INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS

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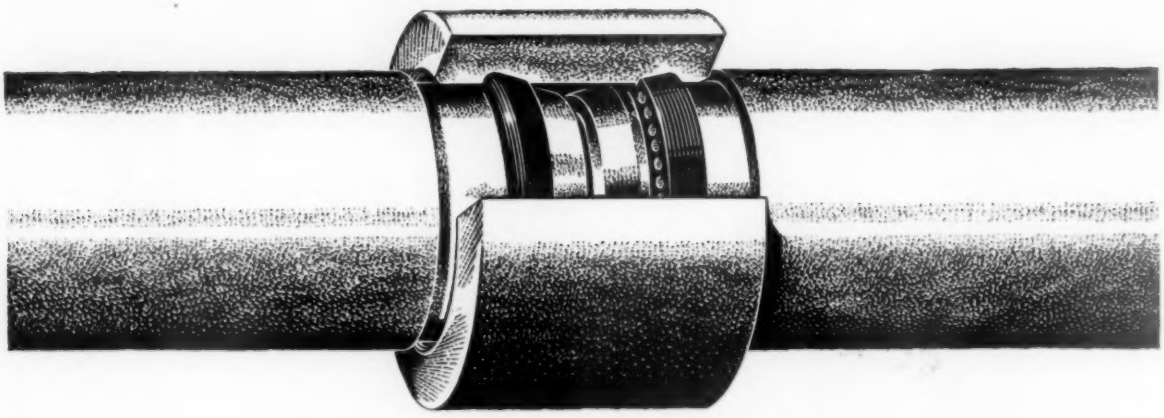
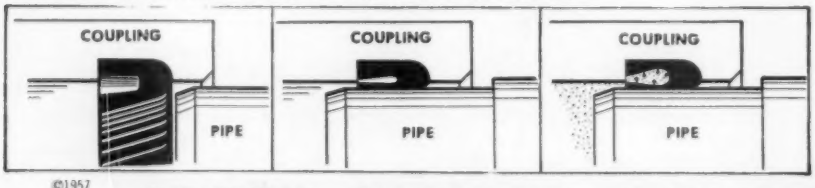
STANDARDIZE ON "Century" ASBESTOS-CEMENT PIPE BECAUSE IT'S EASIEST AND QUICKEST TO MAKE-UP...

just slide it together . . .



you have a tight seal that gets tighter as pressure increases!

HOW FLUID PRESSURE TIGHTENS THE SEAL. Pressure inside pipe forces fluid into sealing rings, causing expansion of seal against pipe and coupling. The greater the pressure, the tighter the seal.



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Write today for Bulletin No. A-C 456 which contains complete specifications on Century Fluid-Tite Coupling and A-C Pipe. Your copy of A-C Pipe Flow Chart, hole punched for your notebook, sent free with each Bulletin.

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Phone: EDison 2-8871

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420 Esperson Building
Phone: FAirfax 3-1153

TULSA 3, Oklahoma
Hunt Building
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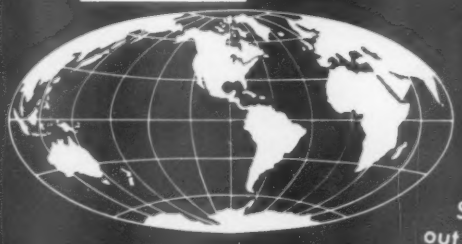
safety is paramount

— in every country

— in every currency

— in every language



SAFETY has about the same connotation throughout the Petroleum Industry of the World—whether it be in the steaming jungles of Indonesia, the burning sands of the Middle East, or on the endless plains of TEXAS.

Life is dear to every man, whether he be a laborer or a man of high estate. His SAFETY is of deep concern, not only to himself, but to those dependent upon him—his family and his employer.

Petroleum equipment like petroleum itself is very valuable, and the more inaccessible and distant its location, the higher its cost becomes. Wherever it is, it is worth PROTECTING and the entire Petroleum Industry is alert to providing the necessary safeguards.

For nearly Forty Years, SHAND & JURS COMPANY has been a leading supplier of SAFETY and CONSERVATION EQUIPMENT to the Petroleum Industry of the World, and to make it available to all who need it, identical equipment is made both in the United States and in Great Britain, so if you deal in Dollars or in Pounds you may avail yourself of the Worlds Best in TANK SAFETY, CONSERVATION and ACCESSORY EQUIPMENT.

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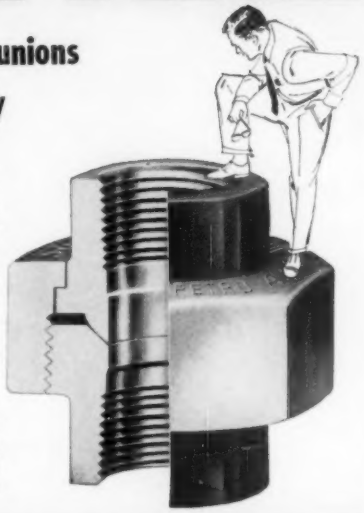
COMPARE

Clayton Mark PETRO® unions are your best buy



Next time you buy forged steel unions, remember to make this important comparison check! Be sure that you get the unions that have *all 16* of these quality points, to assure pressure-tightness, ease of installing, interchangeability, and re-useability. Be sure that you get Clayton Mark *Petro*®—made by the originators of steel unions!

Write—today—for your copy of "How to Tell a Good Union." It describes the importance of the 16 points . . . tells how they add up to better service and complete satisfaction. Order Clayton Mark unions from your distributor; 3000 and 6000-lb. screwed and socket weld types, ⅜" to 3" pipe sizes.

MAKE THIS COMPARISON CHECK BEFORE YOU BUY UNIONS

QUALITY POINT	Petro	BRAND A	BRAND B	BRAND C	BRAND D	BRAND E	BRAND F
Made to AAR standard design	●		●	●		●	
Hardness differential between seats	●	●				●	
Cold-rolled female seat	●					●	
45° cone-to-ball seat	●	●	●	●		●	
Cadmium-plated nut	●		●			●	
Ends taper-reamed before threading	●		●		●	●	
Published steel specifications	●				●		
Each union individually tested	●						
Induction-heated for forging	●						
Hot-forged	●		●	●	●	●	●
Octagon wrench flats on ends	●		●	●	●	●	
Octagon wrench flats on nut	●	●	●	●	●	●	
Rounded nut and end wrench flats	●		●		●	●	
Turbulence-free fit across seats	●		●	●		●	●
Machined surfaces finished to "#40 turn" or finer	●	●			●		●
All sharp corners relieved	●	●					

CLAYTON MARK

CLAYTON MARK & COMPANY
1900 Dempster Street
Evanston, Illinois

They Say—

Fractured Phonetics and the Barditch

Dear Sir:

It was with a great deal of interest that I read your Journally Speaking, "Fractured Phonetics," in the January 14, 1957, issue of The Oil and Gas Journal. I am glad to see that you have taken up the cause of using correct English and refuse to use the corrupted terms which have become so common. I in my own small way have been advocating this same thing for several years. . .

In line with this, I would like to point out a small error which appears on page 73 of the issue mentioned above. The ninth paragraph on that page begins "Barditch drilling . . . ." If you investigate, you will find that the correct term is "borrowditch."

F. T. Focht
Bellaire, Tex.

(Editor's note: The dictionary does not list either "borrowditch" or "barditch," though it gives "borrow pit" as an excavation from which dirt or gravel was taken to make a fill. As far as we can determine, roadbuilders applied the term "borrowditch" to the ditch or gutter left beside a road when the dirt was scooped up to form the crown of a road. Through careless slurring, the term has been shortened to "barditch," and in that form it frequently appears in official state reports such as reports of road construction and highway accidents.

The Journal has accepted "barditch" as an accepted term in the highway industry, and also because it does not violate rules for forming a word and presents no pronunciation problems. "Barditch drilling," as used in the article referred to, therefore means staking wells along a roadside).

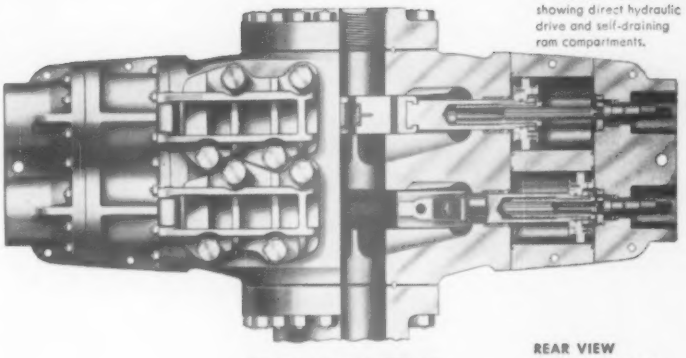
Vanishing American?

"The small independent petroleum producer, a pioneer of America, may soon become another statistic on the pages of history.

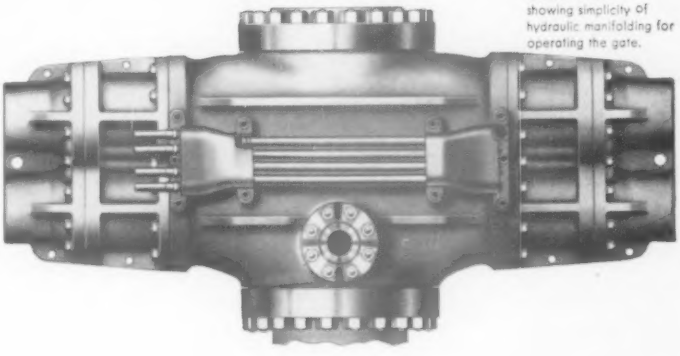
"The pyramiding of wage rises and steel costs have left the price of his product far behind. Unlike most other businessmen he cannot pass these increased costs along to the purchaser and the limit of his absorptive power has been reached.

"Unless the price of crude oil is raised at least another 50 cents per barrel, the extinction of the thousands of independent producers of petroleum

The Cellar Control Gate Features you WANT— *YOU GET* from SHAFFER!



CUTAWAY VIEW showing direct hydraulic drive and self-draining ram compartments.



REAR VIEW showing simplicity of hydraulic manifolding for operating the gate.

Before you make your next investment in cellar control gates, take a moment to think through the various features you would like to have in those gates. You want protection, of course, but protection alone is only *part* of the story. You want such other important advantages as *Compactness . . . Simplicity of Ram Changes . . . Minimum Maintenance . . . Maximum Versatility* . . . and many others.

Then check ANY cellar control gate against the *multiple* advantages you get in Shaffer Hydraulic Cellar Control Gates and you'll see why Shaffer Gates are the top choice of leading operators throughout the oil industry. No other equipment offers *so many* design and performance features—in such a compact "package" as do Shaffer Hydraulic Gates.

For Example . . .

You get

USEABLE COMPACTNESS!

To begin with, Shaffer Hydraulic Gates are amazingly compact in all three dimensions—height, width and length. Even in sizes as large as 13⅝" (12" Series 900) Shaffer Hydraulic Double Gates require only 30" total height—Single Gates 18½".

In addition, there's no need to allow extra space above or at the ends in order to change rams, because Shaffer's exclusive side-opening doors through which the rams are changed open on the dimension where there's plenty of room. Thus, Shaffer's compactness is completely useable compactness!

You get

SINGLE or DOUBLE DESIGN

Some operators prefer Double Gates (two ram compartments unitized into one body) for their greater compactness in a multiple gate hookup. Others prefer the extra flexibility of Single Gates (use them singly . . . in pairs . . . or with a Double Gate for three-way protection). From Shaffer you get what YOU prefer—Double or Single—with both designs offering the same basic operating and construction features!

You get

EASY RAM CHANGES

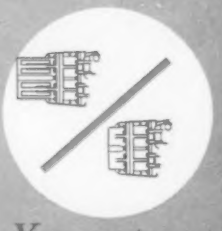
To meet requirements of varying pipe sizes as wells are drilled, the rams must be changed frequently. Shaffer Gates are unsurpassed in the ease with which the rams can be changed. Simply unbolt and open doors in the side of the gate body, slide out the ram assembly, change rams, slide the assembly back in place and bolt the doors shut. It's that simple.

What's more, rams can be changed with equal ease whether the pipe is in or out of the hole!

You get

SELF-DRAINING COMPARTMENTS

You want a gate where no detrimental mud or sand can accumulate to interfere with free ram travel—and Shaffer gives you this advantage, too. Note how the rams travel on guide ribs high above the steeply-sloped gate bottoms. Mud and sand quickly drain back into the well. Also, since well pressure is free to flow to the back of the rams, it actually assists in the closing and sealing action!



You get

RISING or NON-RISING SHAFTS

Do you prefer the quick indication of ram position provided by a Rising type of Locking Shaft? . . . Or do you prefer the greater compactness of the Non-Rising type of Locking Shaft? Take your choice—from Shaffer you can get the particular type that best meets your particular requirements!

THESE ARE ONLY PART OF THE COMPLETE SHAFFER STORY on design and operating advancements . . . advancements backed by the organization that pioneered cellar control gates more than three decades ago. Successful from the first gate built, Shaffer Gates have nevertheless gone through a continuous program of development that has kept them always ahead of the industry. That's why you get more features—plus operating flexibility to meet *your particular preferences* —when you specify SHAFFER. See your nearest Shaffer representative for further details—or write direct!

A copy of the latest Shaffer Catalog will gladly be sent on request. See the Shaffer section of your Composite Catalog.

SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

SHAFFER TOOL WORKS, Brea, California • California Service Shops: Santa Fe Springs and Taft
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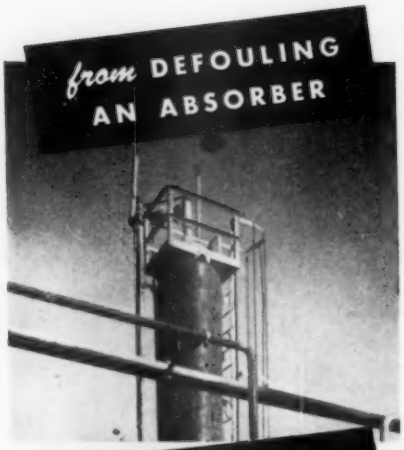
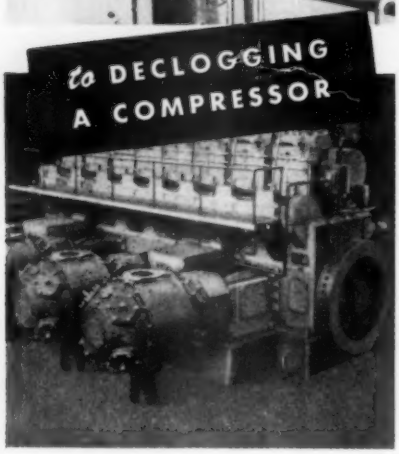
34 years OF OIL TOOL LEADERSHIP





Oakite in-place cleaning improves results, saves time

Removing asphaltic deposits manually from 45 ft. tower took toll of 4 days production for shutdown. Oakite chemical circulation method cut time to 20 hours, production loss to less than a day, and cost only ⅓ as much.

Clogging deposits disappear without need for dismantling compressors by pumping Oakite de-sludging and descaling solutions through equipment. In addition, the Oakite Man showed one refiner how compressors could subsequently be kept *free* from scale, eliminating 12 hours shut-down *every* 6 to 8 weeks.

These are but 2 of many ways to save time, trouble and expense with tested Oakite methods and materials. Others are concisely discussed in Booklet F-7629. Write Oakite Products, Inc., 44C Rector Street, New York 6, N. Y.

OAKITE

SPECIALIZED INDUSTRIAL CLEANING
MATERIALS · METHODS · SERVICE
SCIENCE

Export Division Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

will come even sooner than the present trend would indicate.

"The latest small crude oil price increase was certainly welcome since it was long overdue. But it does very little to compensate for what has already happened and for what the producer can anticipate, namely further rises in wages and steel costs in 1957."

William Wikoff Smith, president, Kewanee Oil Co.

Optimistic Look at U. S. Reserves

"Past discoveries and production have served to increase reserves and estimates of ultimate production rather than to exhaust reserves. Additional discoveries have meant increased production, and this, in turn, has provided the incentive and financial resources for a greater search for oil.

"... Over a period of years proved reserves increase by about half a barrel for every barrel produced, paradoxical as that may seem. While the discovery of oil may theoretically limit the possibility of future discoveries from deposits of unknown size, in actual practice it provides information that enables the industry to find oil that might not otherwise be discovered.

"Until such time as there is clear evidence that the domestic industry cannot find more than a barrel of new oil for every barrel produced, there is no reason to believe predictions that we will soon be running out of oil. As more oil is discovered, the estimate of ultimate production in the U. S. will continue to be pushed upward and the predicted date of running out of oil will be pushed farther into the future."

Richard J. Gonzalez, director and treasurer, Humble Oil & Refining Co., in the January-February issue of the "Humble Way."

"Jillionaires" Have Troubles Too

"British newspapers are being far more prejudicial than factual in asserting that Texas producers are demanding a 'ransom price' for oil needed to replace the blocked supply from the Middle East.

"The British . . . ignore the fact that oil is a world-wide business which is in delicate balance economically, and that what happens in one part of the world can have a major disrupting effect upon another.

"Certainly the situation has not worked out to the complete advantage of oil producers in Texas and other parts of the U. S. The British want crude oil, not gasoline, and gasoline is in great and growing oversupply in the U. S. Some representatives of the gasoline industry foresee disastrous price wars, of which there already are

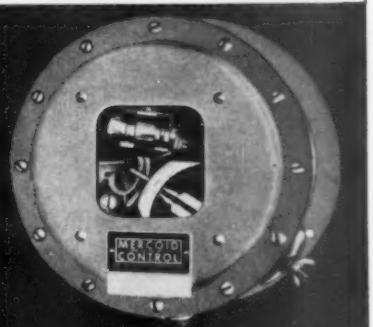
MERCOID®

WEATHER RESISTANT

CONTROLS

VISIBLE

CALIBRATED DIAL
ON-OFF SWITCH POSITION
OPERATING POINT INDICATORS



for pressure or temperature

HERMETICALLY SEALED CONTACT
ZINC PLATED STEEL CASE
OUTSIDE ADJUSTMENTS

FOR OUTDOOR SERVICE OR OTHER APPLICATIONS (NEMA 1A, 2, 3, 4)

Drip Tight
Semi-Dust Tight
Weather Resistant
(Weather Proof)
(Splash Proof)
(Sleet Proof)
(Moisture Resistant)
(Rain Tight)
Weather Tight
(Hose Test)

Write for catalog No. 857W which also lists general purpose controls (NEMA 1) and explosion proof controls (NEMA 7, 9, 9A).

THE MERCOID CORPORATION
4201 Belmont Ave., Chicago 41, Ill.

Beacon • • • and Your Refinery

The marketing of petroleum products is complex. It requires a well coordinated team experienced in both domestic and industrial markets. At Beacon Petroleum Company you will find such a team. Specialists in every phase of petroleum marketing and transportation devoted to one thing . . . moving *your* products successfully to their proper markets.

If you want to successfully market *any* type of petroleum product — contact Beacon . . . or if you want to *buy* any petroleum products . . . contact Beacon.

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TULSA • HOUSTON

MARKETERS OF NATURAL GASOLINE, BUTANE-PROPANE, MOTOR FUEL, FUEL OILS

Cooper

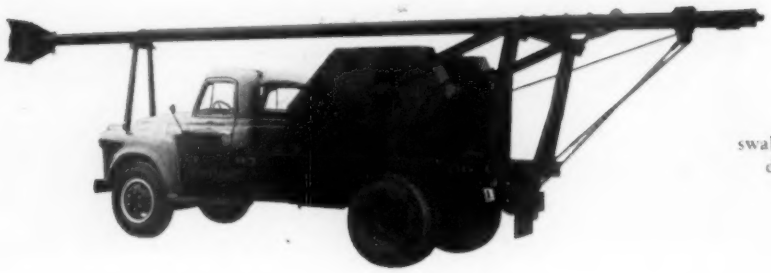
FRED E. COOPER
TULSA
DRAW WORKS
SPUDDERS
WINCHES
POWER SWIVELS

Single Engine Mobile Servicing and Workover Units

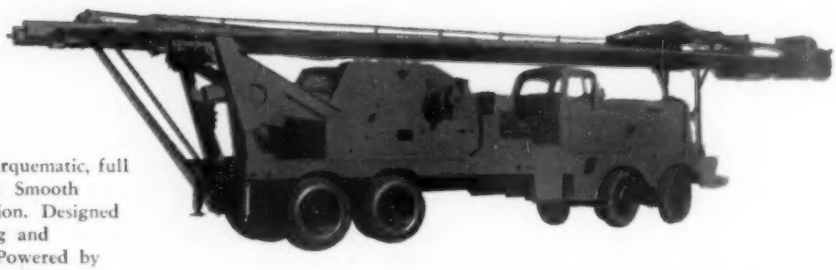
Model E-563 — the only tractor servicing unit built. Unsurpassed for use in mud, sand and over rough, hilly terrain.

Ruggedly constructed for efficient servicing in localized areas. Built in one size only — rated to 6,000 feet.

Model TR — Truck engine powered — Adaptable to any standard truck. Proper weight distribution for legal axle loading. Fast and efficient on the job or on the road. Ideal for wide radius operations. Four sizes, single or double drum for any depth servicing or workover to 10,000 feet.



Model TR — Truck engine powered swabbing unit. A low cost unit especially designed for swabbing. Highly portable — fast to get on and off the job.



Model T 420 Torque converter, torquematic, full torque shifting transmission drive. Smooth shock free power for every operation. Designed for the toughest jobs of servicing and workover on the deepest wells. Powered by diesel or gas — gasoline — butane engines.

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sporadic examples, if the imbalance is not corrected. Thus the smug Texas 'jillionaires' as they are pictured by the British press do not have everything precisely their own way."

Editorial in the Fort Worth Star Telegram.

CALENDAR

FEBRUARY

27-28 Gas Conditioning Institute, sponsored by the University of Kansas extension, Southwest Kansas Center, Randall's, Liberal, Kans.

MARCH

1 American Institute of Chemical Engineers, Sabine area section, and American Chemical Society, Texas-Louisiana Gulf section, fourth annual joint technical meeting, Lamar College of Technology, Beaumont, Tex.

3-6 American Institute of Chemical Engineers, regional meeting, the Greenbrier, White Sulphur Springs, W. Va.

6 American Institute of Mining, Metallurgical and Petroleum Engineers, North Texas section, and North Texas Geological Society, 1957 engineering and geological conference on the Strawn-Pennsylvanian of North Texas, Midwestern University auditorium, Wichita Falls, Tex.

6-8 American Petroleum Institute, southwestern district production division meeting, Statler-Hilton Hotel, Dallas.

8 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

11-13 Chemical Institute of Canada, seventh chemical engineering divisional conference, LaSalle Hotel, Kingston, Ont.

11-15 1957 Nuclear Congress, sponsored by National Industrial Conference Board and Engineers Joint Council, Convention Hall, Philadelphia.

11-15 American Institute of Chemical Engineers, regional meeting, Philadelphia.

11-15 National Association of Corrosion Engineers, Kiel Auditorium, St. Louis.

11-21 Quality Control by Statistical Methods, tenth annual short course, sponsored by University of Illinois, College of Engineering and Division of Engineering Extension, Champaign, Ill.

12-13 Subsurface Geology Symposium, fifth annual conference, sponsored by the University of Oklahoma, Norman, Okla.

13-15 Society of Exploration Geophysicists, tenth annual mid-western meeting, Hotel Texas, Fort Worth.

14 American Society for Testing Materials, New York district meeting, New York City.

18-21 American Society of Mechanical Engineers, national conference, gas-turbine power division, Sheraton-Cadillac Hotel, Detroit.

20-22 American Petroleum Institute, southern district production division meeting, Washington-Youree and Captain Shreve Hotels, Shreveport, La.

25-27 Western Petroleum Refiners Association, annual meeting, Hilton Plaza Hotel, San Antonio, Tex.

25-29 American Society for Metals, Western Metal Exposition and Congress, Ambassador Hotel and Pan-Pacific Auditorium, Los Angeles.

27-29 American Power Conference, Sherman Hotel, Chicago.

30 North Texas Oil and Gas Association, twenty-seventh annual meeting, Kemp Hotel, Wichita Falls, Tex.

APRIL

1-4 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, national convention, Kiel Auditorium, St. Louis.

2-4 Corrosion Control, fourth annual conference, sponsored by National Association of Corrosion Engineers and the University of Oklahoma College of Engineering, University of Oklahoma, Norman, Okla.

7-10 Petroleum Equipment Suppliers Association, annual convention, Palm Springs, Calif.

7-12 American Chemical Society, national meeting, Miami, Fla.

8-10 American Society of Mechanical Engineers, spring meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala.

9 American Institute of Chemical Engineers, Philadelphia-Wilmington section, University of Pennsylvania, conference on catalysis in practice, University Museum, Philadelphia.

9-11 American Welding Society, fifth annual welding show, Convention Hall, Philadelphia.

10-12 American Petroleum Institute, Mid-Continent district production division meeting, Mayo Hotel, Tulsa.

11-12 West Texas Oil Lifting Short Course, Texas Technological College, Lubbock, Tex.

11-13 Institute of Radio Engineers, ninth annual southwestern I.R.E. conference and electronics show, sponsored by Houston section, Shamrock Hilton, Houston.

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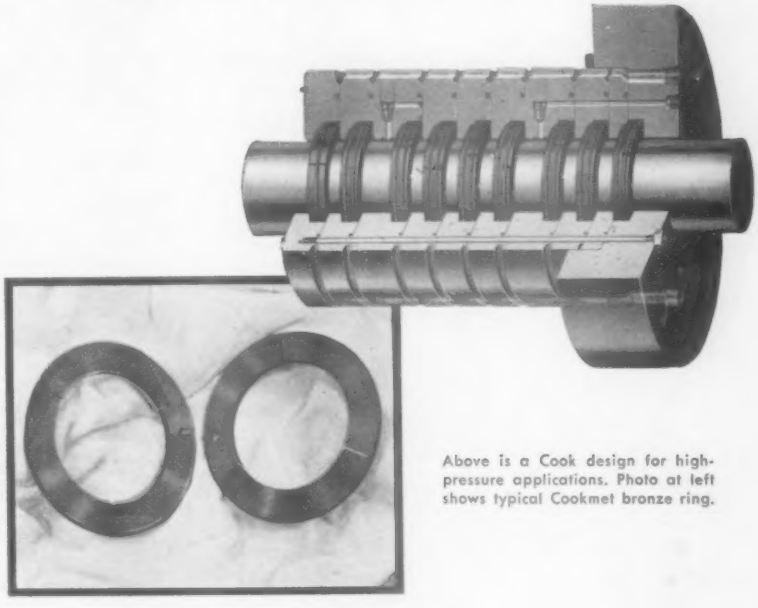

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11-13 Institute of Radio Engineers, second national simulation conference, sponsored by Professional Group on Electronic Computers, Shamrock Hilton Hotel, Houston.

11-13 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest Regional Conference, Portland, Ore.

16-18 Petroleum Industry Electrical Association annual meeting, Shamrock Hilton Hotel, Houston.

16-18 Petroleum Electric Suppliers Association, Shamrock Hilton Hotel, Houston.

16-18 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

16-18 National Petroleum Association, fifty-fourth semiannual meeting, Cleveland.

18-19 Texas Petroleum Research Committee and Permian Basin Section of American Institute of Mining, Metallurgical, and Petroleum Engineers, tenth annual oil-recovery conference, Midland, Tex.

22-25 Canadian Institute of Mining and Metallurgy, annual general meeting, Chateau Laurier, Ottawa.

24-26 National Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.

24-26 American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.

25-27 Appalachian Geological Society, Kentucky Geological Society, joint field conference, southeastern Kentucky.

25-27 American Association of Petroleum Landmen, third annual convention, Hilton Hotel, San Antonio, Tex.

28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla.

29-May 1 Southern Gas Association, annual convention, New Orleans.

MAY

1-3 American Petroleum Institute, Division of Production, eastern district meeting, William Penn Hotel, Pittsburgh.

6-8 American Petroleum Institute, annual pipeline conference, Cleveland Hotel, Cleveland.

6-8 American Geophysical Union, thirty-eighth annual meeting, National Academy of Sciences, Washington, D. C.

7 American Gas Association, committee on underground storage, operating section, Mark Hopkins Hotel, San Francisco.

8-10 American Gas Association, Pacific Coast Gas Association, gas supply, transmission, and storage conference, Mark Hopkins Hotel, San Francisco.

9-10 Symposium on use of surface active agents in water flooding, Pennsylvania State University, department of petroleum and natural gas, State College, Pa.

12-15 Liquefied Petroleum Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

13-15 Industrial Waste Conference, sponsored by Purdue University, Purdue Memorial Union Building, Lafayette, Ind.

13-16 American Petroleum Institute, division of refining, midyear meeting, Sheraton Hotel, Philadelphia.

14-16 Industrial Nuclear Technology Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, Museum of Science and Industry, Chicago.

16-17 American Petroleum Institute, division of production, Pacific Coast district meeting, Hotel Biltmore, Los Angeles.

19-22 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

20-22 American Petroleum Institute, division of transportation, central committee on transportation by water and tanker corrosion symposium, San Francisco.

20-22 American Gas Association, chemical, engineering, and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Fla.

20-23 American Society of Mechanical Engineers, twenty-ninth annual conference and exhibit of the oil and gas power division, Kentucky Hotel, Louisville, Ky.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

23-24 Kentucky Oil and Gas Association, annual membership meeting, Hotel Phoenix, Lexington, Ky.

23-24 American Institute of Mining, Metallurgical, and Petroleum Engineers, third annual joint meeting, Rocky Mountain petroleum sections, Northern Hotel, Billings, Mont.

23-24 Western Petroleum Refiners Association, southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso, Tex.

29-31 Annual short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

These estimates are contained in a recent report made by Premier E. C. Manning to a Royal Commission. Oil and gas experts estimate that during the next 25 years the province's proven reserves should increase by 12 billion barrels of oil and 60 trillion cubic feet of natural gas.

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No Stock Recommendations

While the Bank is prepared to provide all available information on the oil industry, it does not make recommendations regarding the purchase of individual oil stocks.

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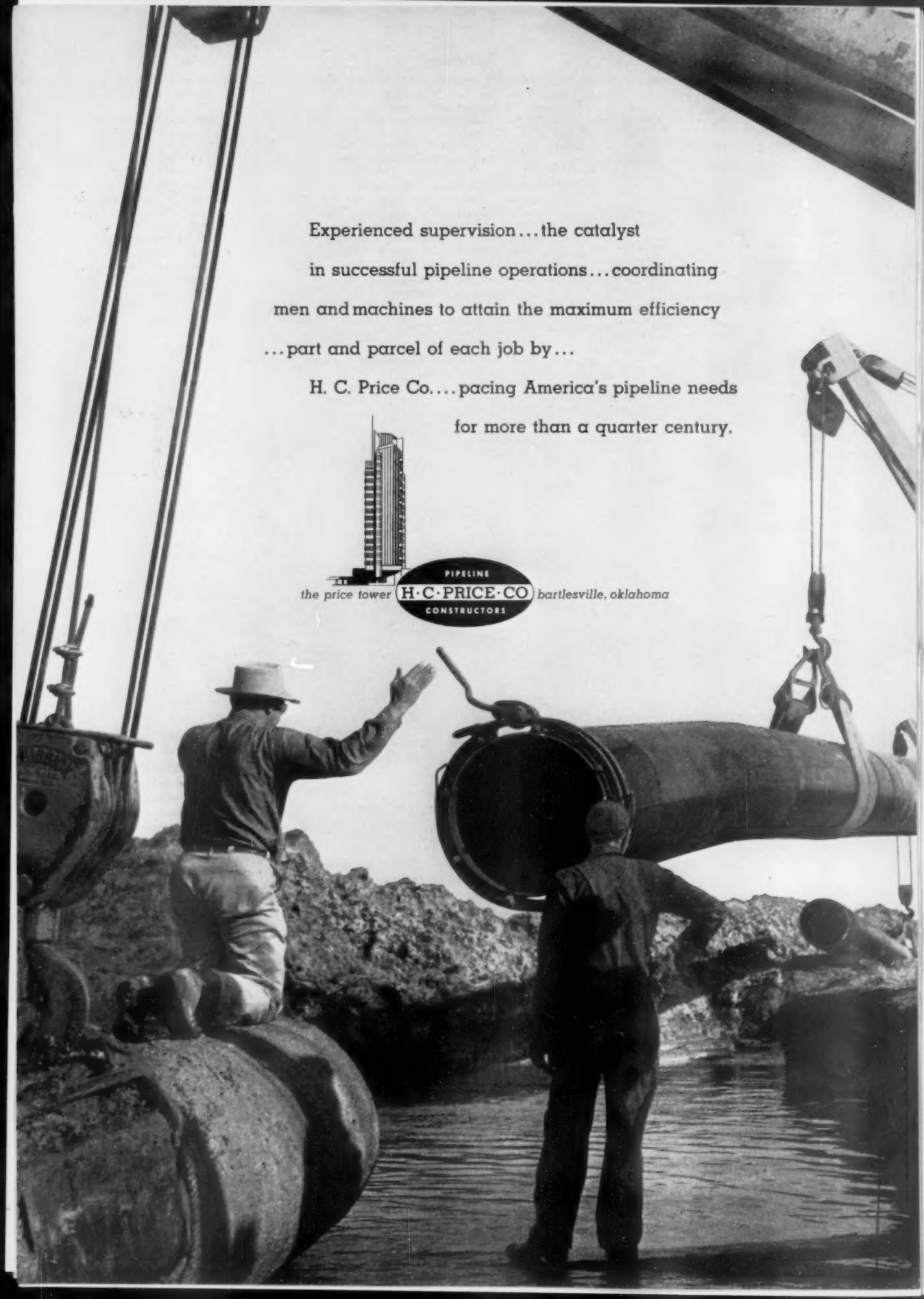
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TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

How Deep Are You?

EVER since Colonel Drake drilled the world's first oil well (oh, all right, Canadians, Peruvians, or anybody else who claims it was a couple of other fellows—let's not go into that again, now), well, anyway, ever since the very, very early, early days of the oil industry, oil scouts have been asking drillers, "How deep are you?"

The standard answer used to be "Deep as a tree," because operators figured it was nobody's business but their own how deep their wells were.

But gradually the industry came to releasing more and more information. For a good many years now, figures have been available on the depths of all wells drilled in the United States. That is, they were available if anybody wanted to go to the trouble of collecting them. Few did. One of the few was our favorite oil publication. The Big Yellow Book has long been known as the best, and for some things the only, source of statistics on drilling.

This week something new has been added.

It's in the tables of statistics on January completions which appear on pages 198 through 206 in this issue, and it includes ever so much more information than has ever been printed before by us or by anybody else.

If you are one of the large body of readers who regularly follow our monthly completion report (always carried in the last weekly issue of each month), you have noticed that this report has been expanded and refined in many ways during the past couple of years. Now it's bigger and better than ever.

Now you can tell how many development wells and how many wildcats were drilled in each of nine (count 'em, nine) depth brackets, and what the results were, in each state and district of the United States and western Canada. You can tell how many feet of hole were drilled in getting oil, gas, or dry wells, either development or exploratory, in any locality.

You can also separate service wells from the "dry hole" column, and thus get a truer picture of the success ratio. Condensate wells are totaled in with oil wells, but our tables also list them separately so you can count them as oil, gas, or in a class by themselves as you prefer. There's also a column showing wells drilled by cable tools—a hard-to-find statistic that's pretty important to some folks.

That column headed DD doesn't mean "drop dead." It stands for "old wells drilled deeper." That's been a troublesome spot in drilling statistics. Some people lump these "drilled deepers" in with completions. But they aren't really new wells, so the Journal has always excluded them from the totals. Now you can get a separate count on these OWDD's and add them to the total if that's the way you like it.

Finally, there's a column of "active operations." These are wells somewhere in the process between digging the pit and final completion and classification. They might be MI (moving in), RU (rigging up), WOC (waiting on cement), TESTG (testing), SD (shut down), or actually drilling ahead.

What difference does it all make? Plenty, my friend. These figures are used by the industry in a great many ways.

One big use is in the study of drilling costs and exploration results. The deeper a well, the more it costs per foot, and with more and more wells now in the deeper brackets the industry must make sure that the money it gets selling oil and gas is enough to recoup the costs of developing new reserves. Otherwise the industry will go broke and the country will run short.

Continuing studies of production and exploration costs are being conducted by important associations and institutions, and they make heavy use of Journal statistics. But they wanted still more details and couldn't get them anywhere. We are proud and pleased to provide the service.

Nowhere but nowhere can you find drilling statistics as complete and detailed as the Journal serves up as a regular feature every month.

—Henry D. Ralph.

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Waltz a little faster, darling— this is a rumba

WHAT'S wrong with the oil industry's public relations? Everything, to judge by the accusations and suspicions heaped on it by Congress and the press these last few weeks.

One by one the charges are being proved false and groundless. So some oil men predict that the industry will "come out smelling like a rose." It won't. It may clear itself with the law but not with the public. The vicious headlines and editorials won't be retracted. They made the industry smell more like a skunk, and the odor will linger on.

No doubt about it, oil is deeper in the doghouse. And it never will get out until it stops repeating the same old mistakes in dealing with public opinion. The industry should:

• ANTICIPATE TROUBLE. Anyone could have foreseen that a congressional investigation would follow a price increase, or assignment of antitrust immunity to 15 companies, as surely as night follows day. But when the blasts caught the headlines, oil was voiceless.

• TALK MORE. Oil men's inbred secretiveness arouses suspicion. All the facts now being brought out about Europe's real needs, actual shipments, transportation bottlenecks, and so on could have been told earlier. Activities which so interest the public should be open to public view.

• BE AGGRESSIVE. If you can't strike first, at least hit back fast and hard. No ground is ever gained by defensive action. A logical defense 2 weeks later, no matter how valid, gets little public notice.

• HAVE A PURPOSE. What's needed is to convince the public that the oil industry has a social conscience and can be trusted to function in the public interest. The formal public-relations program to date has floundered aimlessly, "selling" the importance of oil, the value of research, or the American way of life.

• BE SPECIFIC. Generalities about costs, conservation, depletion, competition, progress, etc. create little interest and less belief.

• HAVE ONE VOICE. Family fights should be kept in the family. Where the industry as a whole is at stake, the whole industry should join forces. And when one segment is unfairly smeared the others should bury their grievances long enough to aid the defense, not add to the smearing.

Frankly, oil's public relations are a generation behind the times. They are out of step and out of tune with today's tempo. Until the industry learns more socially acceptable ways of public comportment it will continue to be hissed, kicked, and pushed around.

Good Wells Make Good News

Which well treatment pays out fastest? There is no single answer to that question. The type of formation, character of the produced fluid, type of completion, market conditions and allowables all enter into the problem. Regardless of the factors contributing to payout time, however, Dowell can tailor a treatment for optimum return. Here are some examples.

- ***Fort Bend County, South Texas*** – (Old well) Thompson Field. Production had declined to one barrel of oil per day. Allowable was 44 barrels. Operator suspected emulsion or water block. Dowell recommended Formation Cleaner treatment using a special Dowell de-emulsifying agent in 1000 gallons of lease oil. Total treatment cost was only $300 and well was restored to its allowable. ***Treatment paid for itself in less than four producing days.***

- ***Hamilton County, Illinois*** – (New well) Completed in Aux Vases sandstone (permeability 70 millidarcys) at 3145-3159 feet. Dowell treated the well with Petrojel*, using 20,000 gallons of fluid (one pound sand per gallon), and a 500-gallon Mud Acid spearhead. Injection rate was 52 barrels per minute at 1100 pounds per square inch. Production after treatment was 80 barrels of oil per hour. After 15 days, well was flowing 300 barrels of oil per day. At two dollars per barrel, ***$3,555.50 treatment would pay out in less than one week!***

- ***Weld County, Colorado*** – (Old well) The Campbell #2, completed in the dirty, shaley, Dakota "J" Sand of the Roggen Pool, had declined in production to 30 barrels of oil per day. Allowable was 40 barrels. Since operator could profit from only 10 barrels daily of any production increase, an inexpensive treatment was indicated. Dowell gave the well an $843 Mud Acid treatment which boosted production to 70 barrels of oil per day. ***In spite of the fact that the net production gain was low, this treatment paid for itself in only six weeks.***

- ***Beckham County, Oklahoma*** – (New well) Production of gas well completed in dense and tight Brown dolomite was a noncommercial 200,000 cubic feet per day. Treated with Riverfrac*, using 30,000 gallons of water with 1 pound of sand per gallon, and a spearhead of 1,000 gallons of Dowell Intensified Acid. Production stabilized at 2,500,000 cubic feet per day. ***At contract prices, $3,700 treatment was paid out in less than 20 days.***

Whatever treatment your well requires, you can get it from Dowell. Good equipment, experienced operators, and the widest selection of fracturing and acidizing techniques enable Dowell to tailor the job to fit your requirements. For more information or service, call any of the 165 Dowell Offices in the United States and Canada; in Venezuela, contact United Oil Well Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

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The Industry This Week

• **INDUSTRY:** There'll be plenty of oil for Europe. This became apparent last week when Texas increased allowable for March by 237,000 bbl. daily and refiners cut runs 200,000 bbl. The moves highlighted the industry's drive to answer its critics. P. 78.

Jersey Standard has surveyed the quality of its chemical engineers. It found them strong in fundamental principles and professional ethics—but weak in writing, public speaking, and engineering judgment. The result was suggestions for strengthening curricula at engineering schools. P. 84.

Industry's new wage patterns may take shape late this month. Sinclair officials will sit down in Kansas City February 28 for talks with O.C.A.W. leaders on their nationwide contract. P. 94.

• **PIPELINING:** A "commodity value" standard for pricing natural gas is being urged on Congress by the FPC. The agency also is trying to draw a sharp line between oil and gas operations in the Natural Gas Act. P. 92.

A large natural-gas line will be built in France within 5 years. The 1,000-mile system will link Lacq gas field with Paris. It will be the answer to that country's acute fuel shortage. P. 98.

Mid-Continent Pipe Line is moving toward an automatic system. A new giant control board permits remote dispatching in the 3,000-mile crude gathering system. P. 95.

Trans Mountain Oil Pipe Line will loop 100 miles of its 720-mile line from Edmonton to Washington this year. P. 95.

• **PRODUCTION:** World's largest hydraulic fracturing job was pulled off last week. Dowell pumped 328,000 gal. of water and 225,000 lb. of sand into T.G.T.'s 1 Thomas near Midland, Tex. Treatment required 28 pieces of equipment and 41 engineers. P. 88.

Relics of shallow-pay boom in California's Santa Fe Springs field are gone. Last wooden derrick in the field was torn down last week. It gave way to big steel rigs probing for deeper oil. P. 96.

• **REFINING:** Shell has won court approval for its right to patent its TCP gasoline additive. Once patent is issued, Shell is expected to announce its position on licensing and royalty. P. 89.

Japan's refinery boom is spreading into petrochemicals. Seven firms now are jumping into this lucrative byproduct field of oil processing. P. 99.

• **DRILLING:** Phillips has a significant wildcat in Beaver County, Oklahoma. It is one of the few oil strikes in that area in the Chester formation. P. 93.

Shell's test in the Delaware basin of West Texas is at the crucial stage. It points up mounting interest in this deep-pay area and may spark a big drilling campaign. P. 82.

Equipment is on its way to northern Luzon for two wildcat tests. Stanvac and PODCO plan wells on adjoining concessions. P. 100.

• **EXPLORATION:** Oil men have put an unusual giant camera to work. It can make photographic copies of seismic records and well logs at the rate of 6 ft. a minute. It makes a formerly tedious job easy, fast, and cheap. P. 87.

Scientists report last year's Hurricane Flossy on the gulf didn't give explorers any clues to building better offshore platforms. But there was one value: It showed oil men how to protect their barges. P. 93.

Another Government sale of leases in the Gulf of Mexico is in the books. Government expects sale to be within next 4 months and bring about $72 million in bonuses. P. 89.

TEXAS RAILROAD COMMISSIONERS Thompson, Culberson, and Murray, just before they raised allowables. Decision left no doubt that . . .

There's Plenty of Oil for Europe Now

THE oil industry began putting out the fires of criticism last week.

Facts—although a few weeks late—finally caught up with fantasy. The result: Heat cooled off a bit around the industry's role in the European oil lift and in increased prices.

Here's what happened during the week:

. . . Texas Railroad Commission increased that state's production allowable for March 237,063 bbl. daily over the February 2 figure.

This makes more oil immediately available for Europe. Companies now can draw down storage below safe levels and send the oil to Europe. They know the stepped up crude flow next month will refill storage.

. . . Refiners cut back crude runs to stills by at least 200,000 bbl. daily.

They also are changing refinery yields to make more fuel oil and distillates. Both actions will swell the volume of crude and products that can go to Europe.

. . . End of the heating season drew closer. This will ease Europe's needs some. Coupled with increased shipments, this should give Europe 90 per cent or more of its normal oil needs.

. . . Industry spokesmen began telling oil's story in Washington with facts.

Such men as M. J. Rathbone, president of Standard Oil Co. (N.J.), Hines Baker, president of Humble Oil & Refining Co., Ernest O. Thompson of the Texas Railroad Commission, and Frank Porter, president of the American Petroleum Institute, testified before congressional committees or held press conferences. Each outlined the oil industry's achievements in supplying Europe and explained the recent price increase.

Sen. Joseph C. O'Mahoney of Wyoming continued to needle the industry. He asked that the Middle East Emergency Committee be scuttled. He also intimated broadly that the Eisenhower doctrine for the Middle East was some sort of oil conspiracy.

Eyes on Texas

Action of the Texas Railroad Commission was the week's most important action.

The commission opened the production throttle as far as it could for March without stacking up crude on the leases. It ordered an 18-day schedule over the state. This means a whopping hike of 237,063 bbl. daily over the February 2 mark and 189,382 bbl. daily over the initial figure for February.

The big March boost will lift Texas production about 380,000 bbl. above its level at the start of the Suez emergency.

Some observers feel that Europe may benefit yet this month. Major U. S. companies, they say, may draw even more for export from pulled-down crude stocks now that they're sure of so much more oil in March.

How it's handled . . . The March order was welcome news to the major crude oil buyers.

Six firms asked for 18 days. The rest, five companies, asked for 17. That would have meant an increase of roughly 86,000 bbl. daily over the February 2 figure.

Buyers favoring the larger hike were largely those operating internationally (or their affiliates) and with ties in Western Europe.

But all purchasers quizzed by the commission said firmly they could handle all oil produced by their connections under an 18-day pattern.

This prompted Olin Culberson, commission chairman, to observe: "The pipelines out of West Texas must have swollen or slicked up a bit in the past few months in order to handle ths much crude."

Purchasers explained that capacity had been hiked and stocks worked off. Some, unable to market all the oil themselves, already had agreed to turn part of it to other buyers needing still more crude. A few will use part of the higher production to pad stocks drained down too far in the past 3 months.

Why the hike? . . . The big boost in the allowable came as a surprise to a num-

HERE'S THE CROWD that filled the Austin Hotel ballroom for the allowable hearing. Widespread interest made it impossible to hold the hearing in the commission's hearing room.

HUMBLE'S PRESSLER
. . . Stocks are at a minimum.

INDEPENDENT HARVEY
. . . Disturbing trend . . . in pipelines.

INDEPENDENT STREET
. . . 8,000 wells still unconnected.

ber of buyers and independents alike.

The spokesman for one of the majors said just before the hearing that he wasn't going to make an all-out pitch for a high allowable this time. He felt it would be of no avail. This was one of the companies with so-called international connections. Others felt much the same.

Commission members told The Oil and Gas Journal after the hearing that its ruling for the fast stepup was based on these four factors:

. . . **Crude stocks** have fallen nationally to a point about 15,000,000 bbl. below the level a year ago. They're about 10,000,000 bbl. below the figure the industry last April deemed about right for that time of year.

. . . **Pipeline space** is there, according to pipeline owners, to move the oil coming from an 18-day schedule. So is the market.

. . . **Gasoline stocks,** though still too high, aren't going up as fast now as at this time last year. Too, the commission has been assured that refiners are cutting runs and shifting yields to cut gasoline and hike fuel oil and distillate output. It hasn't had this assurance at previous allowable hearings.

. . . **Imports from Venezuela,** the commission thinks, are going to be reduced by the majors in line with requests by federal authorities. Here, too, this is the first evidence the body has had that market room would be made for added Texas oil by diverting imports to Europe.

The commissioners denied that pressure from Washington had anything to do with the projected hike in allowable. They feel it is justified now, whereas it wasn't before.

Majors cheered . . . Crude buyers for the major firms, who for 3 months have finagled feverishly and largely in vain for more crude, will be sleeping better this month.

Evidence is that each will get all the

oil he needs, and some will be left over. Magnolia Petroleum Co., unable to find extra oil to buy for months, was proffered crude oil the morning after the hearing.

At the hearing, Humble Oil & Refining Co., the buyer in Texas for the Standard Oil Co. (N.J.) operations, and The Texas Co. told the commission they had been forced to draw down stocks far below normal minimum working levels.

Shell Oil Co. and Gulf Oil Corp. said they were comfortable on stocks but needed and could move and sell their share of oil from an 18-day schedule.

Humble's Herman Pressler told the commission that "our working stocks are at an absolute minimum and can't be reduced further." He said Humble would be unable to find the oil it needs by purchase or any other means on less than 18 days.

Pipeline capacity out of West Texas to the gulf is now adequate, he said, to handle all but about 14,000 bbl. daily of the oil from 18 days. This small excess could be piped north to Wood River, Illinois, and other points.

This would hike the northbound shipment only from 482,900 to 496,800 bbl. daily. And the northbound space is available, he said.

Independents content . . . On the other hand the big allowable jump for March wasn't as big a setback for independent producers at it might seem.

They put up little resistance to an increase, in contrast to heavy opposition to higher output at hearings on January and February flow.

They recommended no desired level for March, merely asking for conservative action and expressing confidence in the commission's judgment. And they weren't much upset by the outcome.

One of the leading independent spokesmen, E. Bruce Street, summed it up this way: "We think the commission knows what it's doing—its past performance has proved that."

Street is president of the West Central Texas Oil and Gas Association at Abilene, Tex. He pointed out during the hearing that some 8,000 wells still are unconnected in Texas.

These operators, he told the commission, are suffering oil losses from trucking amounting to almost 6 bbl. per 100-bbl. load. The losses stem from evaporation during handling and b.s.&w. contamination due to nature of the trucking operation.

He called the commissioners' attention to "a disturbing trend in the way in which pipelines are connecting new wells." In several recent cases, he said, pipeline operators are requiring producers to pay the cost of gathering lines but are then retaining ownership of the lines. Using field maps, he and other independents pointed out instances in fields in Morrow, Knox, Baylor and Schleicher counties.

Another independent leader, A. E. Herrman, president of the Texas Independent Producers and Royalty Owners Association, said the commission "has shown itself to be the most competent judge of market demands."

Hermann said TIPRO feels the producer's situation is improved since there is more pipeline capacity. Also, some responsible officials in Washington now see that imports are too high and that excessive imports are dangerous.

Hermann pointed out, however, that:

. . . **"The imports** picture is still bleak."

. . . **There was no proof** yet of cuts in refinery runs.

. . . **Crude buyers** still weren't hooking up wells. The "only explanation for this is that they don't want to have these connections once present demand is reduced."

He asked the commission to keep its eye on these aspects.

Despite their passive attitude, independents hinted broadly at the hearing that during the coming weeks they will be looking for:

. . . **Sizable cuts** in refinery runs and yield shifts to produce less gasoline.

. . . **Diversion of Venezuelan imports** to Europe. If these things don't come off, they imply the majors can expect more of a fight next time.

The Washington Story

Oil officials spread the industry's rebuttal to criticism before two committees in the capital.

The House interstate commerce committee heard Rathbone. The Jersey Standard president related the part played by his company in moving oil to Europe. More important, he gave his views on the crude and product price increases.

Rathbone's testimony covered much of the ground staked out earlier in a New York news conference *(The Oil and Gas Journal, February 18, page 104)*. But he also revealed the basis for charges of "tie-in" sales that forced unwanted gasoline on Europe.

At the demand of the committee Rathbone disclosed that three refiners on the Gulf Coast had insisted that gasoline be taken along with distillates. On that basis, he said, Southwestern Oil & Refining Co., Texas City Refining Co. and Sinclair Refining Co. sold 302,000 bbl. of gasoline along with 1,365,000 bbl. of distillates.

The refiners probably didn't understand the European situation, Rathbone told the committee. None of the gasoline so bought was sent along to Europe, he said. But Standard companies in Europe have bought some, apparently for the Scandinavian countries which have no refining facilities and must import all products.

About prices . . . Rathbone strongly defended the price increases as long overdue and based on increased costs.

At the request of the committee he will file detailed reports on price increases over the past few years. But he gave the committee some index figures showing the upward trend in costs.

With 1948 as a base (100), Rathbone said, the index cost of finding oil rose to 202 in 1953 and to 225 last year. Development costs rose to 118 in 1953 and 140 in 1956. Production costs increased to 127 in 1953 and 136 in 1956. Total costs jumped to 153 in 1953 and 172 in 1956.

Texas heard from . . . The House committee was told earlier that the melting European crisis supported the position taken by the Texas Railroad Commission in restraining production increases.

Ernest O. Thompson testified that the commission has been cautious, but is ready at any time to permit higher crude output if high administration officials ask it on the basis of national security. The commission later increased Texas' allowables.

From its questioning of these witnesses the committee learned two things. It got explanations of why prices hadn't been increased earlier and why Venezuelan crude is still coming to this country instead of being diverted to Europe.

Many in the industry had been stressing the need for a price increase over the past 18 months to 2 years, the committee learned.

But an increase had three strikes against it. There was the general belief that an additional 2,000,000 or more barrels per day could be had by the turn of a valve. That was true as to productive capacity, but not as to transport. The heavy aboveground stocks also hung over the market; they now have been largely moved. Finally, the import situation weighed prices down; an increase would have encouraged still heavier imports.

Imports explained . . . Some of the crude from Venezuela is specialty oil that cannot be replaced by domestic crudes, Rathbone said.

But there are other reasons for the import of Venezuelan oil. It is true that Venezuela is closer to Europe than is the Gulf Coast. But it is also closer to the Northeast U. S. than is the gulf. And the law requires that coastwise shipments must move in U. S. flag tankers. These have not been available to handle any further great increases in coastal movement.

GEN. ERNEST O. THOMPSON of the Texas Railroad Commission took a lot of heat off the U.S. oil industry with his testimony at a House committee hearing. The industry, he said, has done an amazingly successful job. Texas boosted allowables three times after Suez, he said, in spite of the fact it never received a Government request to do so. At the time of the hearing, he declared, Texas production was flowing at a rate 250,000 bbl. daily higher than when the Suez Canal was blocked.

Even if all the Venezuelan oil was sent to Europe it would release only enough tanker space to move an additional 13,000 bbl. a day of Persian Gulf crude around Africa to Europe, Rathbone said. Even though this represents only 0.4 per cent of the European product demand the M.E.E.C. is studying it carefully, he indicated.

A.P.I. speaks up . . . The European program is being used as a stick to beat the industry, it was charged by A.P.I. President Porter.

Porter called a special press conference in Washington to answer charges against the industry. The industry has no spokesman, he explained. But the A.P.I. thinks, in view of all the criticism, that some of the confusion should be cleared up.

The O'Mahoney probe is centered on oil for Europe, the price increases and monopoly, Porter said.

"Their case so far as failure of the industry to meet Europe's situation is concerned has fallen completely apart," Porter declared.

The testimony of independent producers justifies the crude price increase "and cannot be refuted." Competition in the market place will take care of the increases on products.

Far from being monopolistic, oil is the "most competitive" industry in the country, Porter said. There has never been evidence of collusion on prices.

The oil companies have made the "largest and fastest shift in the distribution of any commodity ever achieved in peacetime, first through their own initiative and later through the operation of the M.E.E.C. at the request, and under the supervision, of the federal Government," Porter said.

Baker on prices . . . Humble President Hines Baker explained to the Senate committee why his company led off the crude-price increases.

Baker said factors making the higher prices necessary were:

. . . **A 50 per cent jump** in Humble's oil requirements to meet its customer demand in Europe.

. . . **Higher costs** of labor and materials in the oil industry.

. . . **Drop in the rate of return** on domestic petroleum investments.

. . . **Continued decline in ratio** of known domestic reserves and demand.

Baker warned that domestic demand is moving up faster than reserves and this is leading to a hazardous dependence on Middle East supplies. He said the Suez crisis shows that the nation's crude reserves should grow as rapidly as demand. And on this basis higher crude prices were needed to make exploration possible.

M.E.E.C. under fire . . . O'Mahoney leveled his guns at the M.E.E.C. and said it should be dropped.

The Wyoming senator added if it is still allowed to function in the emergency, "strictest sanctions" should be put around it to insure that independent producers and refiners are not injured. O'Mahoney alleged the committee has produced monopolistic practices.

But Asst. Atty. Gen. Victor R. Hansen, head of the Justice Department's antitrust division, assured the senator that adequate controls have been kept on M.E.E.C. actions. He added his department is making investigations of all antitrust aspects of the oil program. He said success of the European oil lift justifies the limited antitrust immunity granted the companies.

The Government probes . . . Hansen told O'Mahoney the recent price increases "resulting almost simultaneously and by the same amount for virtually all companies" has prompted general complaints that it stemmed from collusive action.

He reported his department is making investigations but not solely from the standpoint of prices.

The success of the plan in meeting Europe's oil needs justifies the limited antitrust immunity granted the companies, Hansen asserted. No other plan could be found which would have met the need so quickly and fully.

Hansen, who has just returned from Europe, said the plan has eased the shortage in Western Europe. It has prevented "a possibly disastrous situation in which our NATO allies would have found it extremely difficult, if not impossible, to keep up a minimum of necessary industrial activity."

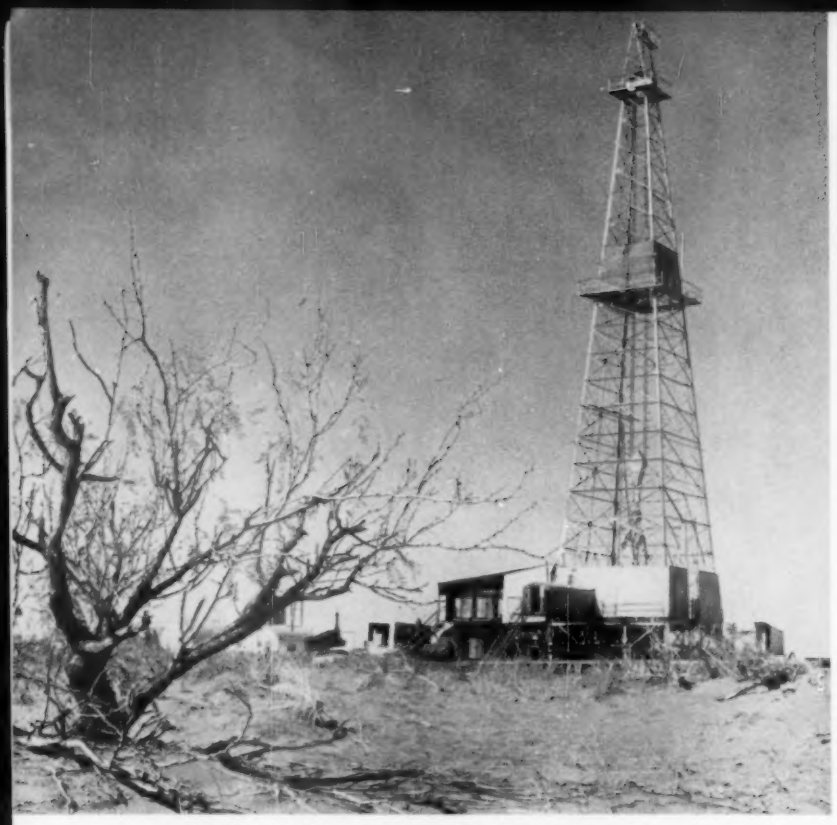
New demand figures . . . A special report by the Office of Oil and Gas of Interior Department last week called for a U. S. crude output of 7,606,000 bbl. daily for the next 6 weeks.

First quarter domestic demand was put at 9,890,000 bbl. daily. Exports were seen as 765,000 bbl. daily including 500,000 bbl. for Europe. Total demand thus will be 10,655,000 bbl. daily.

Demand could be met by: withdrawing 738,000 bbl. daily from stocks, imports of 1,466,000 bbl., natural-gas liquids production of 845,000 bbl., and domestic crude production of 7,606,000 bbl. daily.

This shows that U. S. output "should be increased by 300,000 bbl. daily in next 6 weeks to meet requirements," the report said.

Texas' increased March allowable will account for more than half of this, and cuts in refinery runs should more than make up the difference.



SHELL WILDCAT, now in crucial testing stage, could give . . .

Kick For A New Basin

Shell's deep costly wildcat venture in West Texas points up mounting interest in Delaware basin despite obstacles

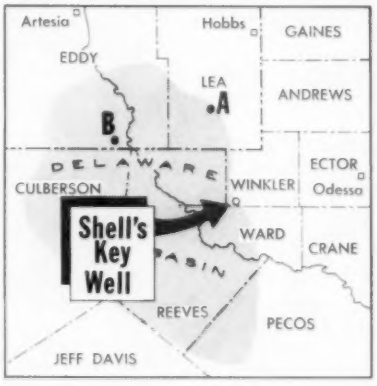
MIDLAND, Tex.—There are signs that a strong deep-drilling campaign may be shaping up for the tough but promising Delaware basin of West Texas and southeastern New Mexico.

Geologists have long pointed to this large basin (shaded area on map) as one of the few areas left in the country where "big oil" likely will be found.

Many feel that some day it will become another Midland basin. Deep discoveries in this basin, Delaware's northern cousin, several years ago kicked off a play which is still going. It made the Midland basin one of the nation's biggest producing areas.

Yet the Delaware basin has seen very little deep drilling. One reason is that deep tests there are unusually costly. Formations are extremely hard. And drilling costs of $3,000 a day are normal.

Along with the high costs, deep Delaware horizons are hard to figure. Much of the basin is overlain with "valley fill," a thick layer of alluvium eroded from an ancient mountain range. This makes it hard to get good seismic records tracing the basin's deep beds.



So far, nearly all Delaware basin output is coming from the Delaware sand of the upper Guadalupe series of the Permian from 1,000 to 5,500 ft.

Important tests . . . During the past 2 years, however, the basin has begun to rumble. All information hints that a lot of deep holes are going to be punched down despite the obstacles.

In April 1955, Continental Oil Co. warmed operator interest in the basin when it completed a big Devonian gasser on the northern rim. The company's 1-A Bell Lake Unit (A on map), in Lea County just south of its Pennsylvanian field discovery, came in at 14,942-15,025 ft. flowing 15,000,000 cu. ft. of gas a day.

El Paso Natural Gas Co. fed the flame last October with a large Pennsylvanian gas strike 40 miles to the southwest in Eddy County, New Mexico, just north of the Texas line.

This wildcat, the 1-X Welch (B on map), was completed at 12,502-22 ft. for 27,000,000 cu. ft. daily. It is much farther into the basin—about 30 miles from the northern edge and midway between the east and west rims.

Shell's well . . . Last week, Shell Oil Co. had about reached the crucial point in tests of another deep try, this time on the eastern rim.

Shell was preparing to fracture the Pennsylvanian at about 13,480 ft. in its University 17-A-1. The wildcat is about 5 miles southwest of Wink, Tex., in Winkler County, 35 miles south of the Conoco discovery, and 50 miles southeast of the El Paso well.

The test reached a total depth of 17,410 ft. in the Devonian where it had a slight show. Plugging back, it got another slight show in the Mississippian topped at 15,675 ft. But both zones had little porosity.

The Pennsylvanian, topped at 13,460 ft., showed more promise. Shell ran several drill-stem tests. The best, through perforations at 14,028-62 ft., developed a flow of 2,439,000 cu. ft. of gas daily through a 20/64-in. choke on a 12-hour test. The well also produced 147 bbl. of distillate. Shell acidized with 2,000 gal. prior to the test.

The gas flow fell off to 239,000 ft. daily, however, during a later test of the same zone. And a test at 13,600-40 ft. flowed only 78,000 cu. ft. of gas and 10 bbl. of condensate daily through a ¼-in. choke after a 500-gal. mud-acid wash.

Shell should know this week if the fracture treatment will shake loose more production from the top portion of the Upper Pennsylvanian.

If the test makes a good producer, the industry may well see an influx of heavy rigs into the basin.

Venture costly . . . Shell will have paid dearly whether the 17-A-1 hits or not.

The hole is Shell's deepest in West Texas and is believed to be only the second to reach the Devonian in the Delaware basin.

So far the wildcat has cost the company about $1,300,000.

It is located on a 2,561-acre University Lands drilling block (Section 10, Block 17) which Shell bought in June 1955 for $10,000.

Drilling and testing have been going on now for 504 days. The test consumed 25 diamond bits and core heads costing about $20,000. The deep rocks were so hard, Shell employes could strike sparks from them with a file.

During the last days of drilling, chert was chewing up diamond bits at a rate of one every 4 to 5 ft. All told, Shell paid for and wore out 165 rock bits costing $29,000. While the contractor, Corbit Drilling Co., used up another 320 costing $30,500. The 17-A-1 gulped down $175,000 worth of drilling mud and additives.

The well so far has cost an average of about $2,500 a day.

Indians Push Deal

Blackfeet revise contract, await action in Washington

BROWNING, Mont.—A revised contract to permit a private company to manage Blackfoot Indian Reservation oil and gas lands has been officially submitted to the Interior Department for approval.

An unofficial draft of the agreement with the Tribal Development Co. recently was termed "unconstitutional" under the Blackfoot constitution by Glenn Emmons, commissioner of the Indian Bureau in Washington.

Emmons said the tribal council has authority to hire technical professional oil and gas consultants, but it cannot give Tribal Development Co. complete control over reservation exploration, development and production.

The tribal council in September 1956, agreed to give the company "full, complete, and exclusive right to manage, supervise, and control" all phases of tribal oil and gas activities.

Tribal Development Co. is composed of Wilfred Nadeau, Cut Bank, Mont.; Cardinal Drilling Co.; W. R. McDonald, Browning, Mont.; W. J. McLaughlin, Great Falls, Mont.; and Thornton Davis, San Antonio, Tex.

Kermac Expands Refinery

OKLAHOMA CITY.—Kerr-McGee Oil Industries, Inc., is adding two new units at its refinery at Wynnewood in southern Oklahoma.

Work already has begun on a new 5,500-bbl. Platformer and a 4,000-bbl. Unifining unit. These units will not increase the refinery's capacity of 15,000 bbl. per day, but will improve quality of products.

Kerr-McGee has two other refineries in Oklahoma, a 19,000-bbl. plant at Cushing and a 14,000-bbl. refinery at Cleveland.

watching WASHINGTON

. . . with Bertram F. Linz

And then came the facts . . .

THERE'S a sneaking idea in some Capitol quarters that Rep. Oren Harris of Arkansas beat Sen. Joseph C. O'Mahoney of Wyoming to the punch on the European oil lift.

While O'Mahoney's double-deck subcommittee was driving in all directions to show up the international companies' alleged failures, Harris got the real lowdown.

It was Harris' commerce committee that got the first definite figures on how much oil Europe is getting, and from where. They were given by Assistant Secretary of Interior Felix E. Wormser, who had been given a rough going-over on price increases by Sen. Estes Kefauver when he appeared earlier before the O'Mahoney group.

Harris got the Texas story from Gen. Ernest O. Thompson. It showed that the Texas Railroad Commission never was convinced that there was a "crisis." And it showed that Texas was ready to raise its production any time the administration said national security was in danger.

Finally, Harris got the companies' side from M. J. Rathbone, president of Standard Oil Co. (N.J.), last week.

O'Mahoney came out on top in one respect, however. He started his probe first. So he got the television and news cameras and the big headlines in the newspapers.

Miniature decontrol . . .

SEN. ESTES KEFAUVER of Tennessee has two ideas which will affect federal control of gas producers.

He is pondering a bill to make the Federal Power Commission hold public hearings on producers' prices which are protested by public bodies or others.

And he is backing the old idea of exempting independent producers from price control if their annual sales don't exceed 2 billion cubic feet.

Kefauver's first idea was sparked by FPC approval of a price increase by Union Oil & Gas Corp. of Louisiana. He says that 108 per cent hike shouldn't have been made without a public hearing. He says the FPC's "bogged down docket" offers an excuse for failing to make sure the consumer isn't gouged.

The plan to free the small producers was first offered as an alternative to the bill to wipe out federal control entirely. It wasn't accepted then. It won't be now. But it will offer a fighting point for opponents of a Harris-type bill—if and when one is brought up in the Senate.

Imports strategy elusive . . .

PRESIDENT EISENHOWER sent his first annual report on the trade agreements program to Congress this month. But nowhere in it did he give any hint of his feelings on the national security clause as applied to oil imports.

This was the first time a President has been called on to account to Congress for actions under the 8-year-old general agreement on tariffs and trade. The report was demanded in a provision written into the law in 1955. Section 7, the national security clause, was written in at the same time.

Eisenhower related the steps taken in the attempt to keep oil imports in line with domestic output. He noted that Mobilization Director Flemming laid the question aside in December because of the Middle East situation.

The President said that at that time Flemming found that the importers' 1957 program, if carried out, would have left him no course but to send the problem to the White House. But Eisenhower gave no indication of the course that would be taken to control imports if such a showdown occurs.

Jersey Standard's View of the Chemical Engineering Curricula

Strong Points

1. Fundamental principles of engineering
2. Professional ethics

Weak Points

1. Writing
2. Public speaking
3. Engineering judgment

And Its Suggestions for Strengthening It . . . .

- ✓ Reduce time spent on qualitative and quantitative chemistry, engineering drawing.
- ✓ Increase time on statistical theory.
- ✓ Provide a better understanding of how electronic computers can help engineers.
- ✓ Integrate more fully the teaching of physical chemistry and chemical-engineering thermodynamics.
- ✓ Increase the number of open-book examinations.
- ✓ Increase the contacts of teaching staffs with challenging industrial problems.

Just How Effective *IS* College Training?

BOTH industry and Government are worried about the number of engineers coming out of U. S. colleges and universities. While this concern is general, Standard Oil Co. (N. J.) sees another problem in the field: Quality.

Jersey took a good look at 125 recent graduates who answered 18 questions each on a self-analysis basis. Then it checked findings against the opinions of 76 supervisors.

The results show that the young engineers are strongest in their knowledge of chemical engineering principles and their high regard for professional ethics. The weakest points are communications—both written and oral—and engineering judgment.

All students tested had earned their last degrees in 1949 or later. They represented 51 different schools. Their degrees were B.S., 61 per cent; M.S., 33 per cent; and Ph.D. or Sc.D, 6 per cent. All are employes of Esso Standard Oil Co. or Esso Research & Engineering Co.

Results of the survey have been sent to the graduates' schools. The results are not only of potential value for revising curricula, but could be of very great value to engineers, chemical or otherwise, already on the payroll of oil companies.

The survey emphasizes that knowledge of principles is fundamental. Technology of an industry can be taught to a man after he goes to work in it, the survey says. It is seldom, however, that he can make up for a lack of fundamentals. It finds this particularly true in keen technical competition.

The Esso companies' experiences in the area of professional ethics have been "eminently satisfactory." Much credit for developing this intangible but important quality is given to teachers, the student's first contact with chemical engineering.

"It is to the credit of these teachers," the report states, "that, almost without exception, the company has had no instances of breaches of professional ethics. It is also to the credit of these teachers that their graduates are so willing to help their associates, especially the men from succeeding classes, in getting off to a good start in their first jobs in a new field."

The three areas where curricula improvements are most strongly recommended are effective writing, effective speaking, and engineering judgment.

Effective writing . . . The recent graduates listed English and report writing first and third, respectively, as the most important nontechnical subjects. Their supervisors agreed. Letter and report writing were listed as the "greatest weakness" by 45 per cent of the supervisors.

Four recommendations were made:

. . . Importance of English grammar, and a thorough grounding in it, should be emphasized by engineering schools and industry.

. . . The need for effective-writing in industrial and academic work should be impressed on students by college faculties.

. . . Students should be encouraged to write for college papers and engineering magazines.

. . . Stereotyped laboratory reports should be avoided.

Students should figure out for themselves what a report should contain and how it should be presented. Many deviations from stereotyped reports can

be worked out, the report finds. None will be effective, however, unless the student gets competent guidance and is graded on writing as well as on technical content.

Effective speaking . . . Public speaking was a very close second to English among the "principal weaknesses" rated by the graduates. Supervisors listed it third.

The graduates added emphasis to their viewpoint. They were asked, "What subjects (technical and nontechnical) do you wish you had taken?" They put public speaking first among the nontechnical subjects. Further, they felt that only three technical subjects were more important.

Most recent graduates cannot prepare an effective 10-minute talk on a technical subject on which they are well versed. They overestimate the number of ideas they can present, do not organize, and are unable to visualize what their audience knows or what is important to it.

More time on effective oral communication is recommended. This, the report holds, must be spearheaded and supported by the professors to whom "engineers usually pay most attention."

Engineering judgment . . . Second most important area in which weaknesses show up, according to the supervisors, is engineering judgment.

Graduates also place this high on the list. They favor more "open book" examinations. This is the method recommended by the supervisors for improving engineering judgment. Problems that challenge judgment and knowledge of fundamental principles, rather than memory, are needed, the report finds.

Open-book examinations and homework should involve one or more of these:

. . . Choosing significant data from among a mass of extraneous information.

. . . Applying logic to arrive at an optimum solution from several alternates.

. . . Deciding if a solution is possible without more data and, if not, what data is needed and how it should be obtained.

. . . Deciding whether detailed calculations are necessary for an accurate answer before carrying them out.

Courses in statistics . . . Few recent graduates have a good working knowledge of statistical theory, according to the report.

It says that the complexity of today's processes and the cost of tests constitute a fertile field for the application of statistics. One of five graduates would like to have studied statistics. The report urges a brief course in statistical theory.

Electronic computer information . . . High-speed, high-capacity electronic computers are becoming more important all the time. They relieve engineers of repetitive, time-consuming calculations. The survey shows chemical engineers spent 34 per cent of their time figuring calculations. This is more time than is spent in any other phase of their work. The report adds that few men appreciate how computers can help them do a better, faster job.

The report says they can forget the workings of computers but should know their advantages and limitations. It recommends that this be taken care of by the chemical-engineering departments of colleges and universities.

Thermodynamics, chemistry . . . The combination of physical chemistry with chemical-engineering thermodynamics and reaction kinetics in a better manner is recommended. This should be done both in lab and classroom courses. The report emphasizes the need for teaching fundamentals in a coherent pattern.

Much time is being spent on qualitative and quantitative chemistry. This is an overwhelming view of both the graduates and supervisors. It is especially true in the laboratory portions.

The report points out that in current industrial practices, much of the analytical load is handled by spectroscopic, infrared, ultraviolet, and other analytical methods. Therefore, few chemical engineers need more than the basic concepts of analytical chemistry and a knowledge of how today's ana-

How Jersey Standard's Test Group . . .

1. Is distributed:

	Number
Chemical-engineering design	40
Economics studies	40
Laboratory research, including pilot-plant studies	23
Technical review and advice on refinery operations	15
Engineering test work on refinery equipment	3
Computer programing	2
Product-sales engineering, technical advice	2
Total	125

2. Spends time:

	Percentage of time
Collection, correlation of data	26
Calculations	34
Writing reports, letters	20
Selling results of their work	12
Others	8
Total	100

3. Involves skills:

	Per cent total skill required
Engineering	24
Logic	23
Judgment	23
Mathematics	14
Effective speaking	12
Others	4
Total	100

Weak Points of the Group . . .

As supervisors see them

	No. students
Writing letters, reports	125
Technical judgment	57
Oral presentations	51
Personal characteristics	33
Organization and planning	31
Knowledge and application of chemical engineering fundamentals	23
Interest in and knowledge of economic aspects of jobs	19
Technical accuracy	11
Originality, creativeness	11
Relations with others	10
Knowledge and application of mathematics	9
Ability to reduce theory to practice	9
Knowledge and application of other fields of engineering	7
Knowledge and application of statistics	5
Ability to think on fundamental basis	5
Knowledge and application of sciences	4
Tendency to overspecialize	1

And would solve them

	No. recommendations
Put more emphasis on technical report writing	15
Put more emphasis on letter writing	10
Teach conciseness and clarity	9
Put more emphasis on English composition and grammar	7
Put more emphasis on technical writing as part of existing technical courses	7
Incorporate an industrial viewpoint in report and letter writing	4
Include dictation practice	1
Total recommendations	53

lytical tools can help solve complex problems.

It might be possible, it adds, to make qualitative and quantitative chemistry courses entirely elective.

Engineering drawing . . . Chemical engineers need to know how to read blueprints. They also need to know how to prepare engineering sketches. The report doubts that spending time learning how to make inked tracings is justified.

Industry has nontechnical draftsmen and tracers to do the job. Therefore, the report recommends, chemical-engineering departments should take a critical look at the time spent on engineering drawing.

Contact with industry . . . Most graduates look on their teachers with great respect. Unprompted comments, however, led to this conclusion: Teachers' contacts with industrial problems would enhance their effectiveness as teachers. The report concludes that consulting work and summer work in a variety of industries by teachers would lead to better educated graduates.

While all students tested by Jersey eventually went into oil, few had planned ahead for it. Almost three out of five reported they had spent "too little time" learning about oil in their undergraduate days. While 57 per cent said they had "too little," 42 per cent said they had "just about the right time," and only 1 per cent said "too much time."

As a rule, they don't think they spent too much time in school. Seventy-one per cent think that more than 4 years would be required to get a B.S. degree. This is how they'd spend the additional time:

More "humanities"	70
More chemistry	9
More mathematics	37
More cooperative work with industry	46
More work in engineering courses	45
More business courses	3
More physics courses	1
More seminars	1
Total comments	212

The report was presented by John W. Packie and Charles W. Smith, Esso Research & Engineering Co., at a symposium on "Does Present Chemical Engineering Education Meet Modern Industrial Needs?" The symposium was sponsored by the division of industrial and engineering chemistry of the American Chemical Society.

Engineering Schools Fill Up

SOME important changes are shaping up in the engineering-manpower picture.

On the bright side, the bottleneck of student recruitment apparently has been unplugged. A bumper crop of 44,000 engineering graduates, nearly twice the number which received B.S. degrees last year, will move into industry in 1960. Enrollments are still climbing.

On the other side, however, a new problem is cropping up to take the place of the old one. Educational facilities are not keeping pace with enrollments.

These developments were reported by the Enginering Manpower Commission of Engineers Joint Council and the Scientific Manpower Commission. They said the major problem is no longer one of getting students to enroll in engineering courses. The big job now is to find a place for engineers to study.

The two commissions said many schools are already filled to capacity and the situation is growing worse.

The commissions have made the solution to the problem a major objective and will put it on this year's agenda of the national conference which they sponsor. The American Society for Engineering Education is also planning a close study of the problem.

Last year 77,738 students enrolled in freshman engineering courses. While this was 10 per cent below predictions, it was still a jump of nearly 5,000 in 1 year.

Based on a time-honored formula, however, only 57 per cent of these students will still be around for graduation exercises in 1960. But at that rate, more than 44,000 will make the grade.

The table below shows what is happening at the nation's engineering schools.

ENGINEERING DEGREES

	1955-56	1954-55
B.S.	26,306	22,589
M.S.	4,705	4,379
Ph.D.	610	599

ENROLLMENTS

	1956-57	1955-56
First year	77,738	72,825
Second year	55,767	50,841
Third year	44,610	39,377
Fourth year	37,571	31,300
Fifth year regular	1,387	1,358
Fifth year cooperative	1,838	1,450
Other	32,210	24,297
	251,121	221,448
M.S. graduate students	22,529	18,482
Ph.D. graduate students	3,402	3,163
Total	277,052	243,093

——Industry briefs

A bill to boost Oklahoma's depletion allowance from 20 to 27½ per cent has been introduced in the state legislature by Rep. James Arrington. The bill is sponsored by the Oklahoma Independent Petroleum Association. The association claims the recent crude-price increase and a stronger market demand will provide the state additional oil revenue of $2,500,000 a year, while the depletion increase will cost the state only $650,000 a year.

New Chamberlain Petroleum, Ltd., Calgary, plans to acquire the assets of Commercial Minerals, Ltd., Edmonton, in a stock-exchange deal. The deal is pending clearance by the Canadian Government.

A bill to increase the gross production tax on oil from 4¼ to 5½ per cent has passed North Dakota Senate by 28-20 vote. It now goes to the House. This new revenue would go into the state general fund.

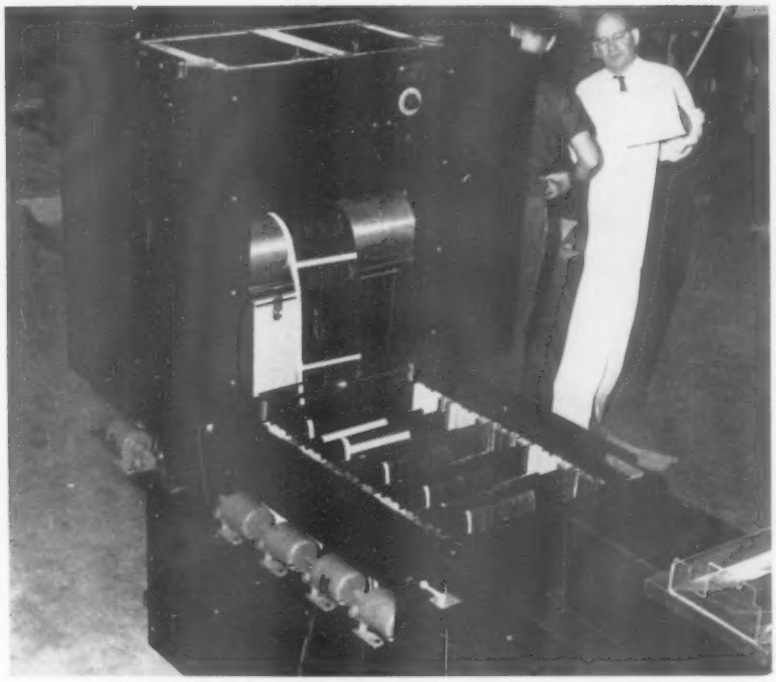
Scurry-Rainbow Oil, Ltd., and Canadian Pipelines & Petroleums, Ltd., are planning to merge. The stock-exchange deal, on a share-for-share basis, would make the consolidated company one of the largest independent oil firms in western Canada. It would use the Scurry-Rainbow name.

The companies hold interests in 8,500,000 gross acres and 2,900,000 net acres in the three oil provinces of western Canada. Combined oil production totals about 2,750 bbl. daily from 375 wells. The companies also hold interests in 25 gas wells, all of which are capped. Stockholders will vote on the merger after April 29.

Latex Oil & Gas Co., Shreveport, has been dissolved and its oil properties split among the former owners. James E. Kemp, Dallas, has taken over the properties in East Texas. Jones-O'Brien, Inc., Shreveport, has assumed operation of the Louisiana holdings.

Gas production in Louisiana increased 12.2 per cent last year, reaching almost 2 trillion cubic feet.

Conservation Commissioner John B. Hussey reports "nearly final" figures shows the state's total gas production reached 1,942,699,475,000 cu. ft. in 1956. This is 12.2 per cent over 1955's production of 1,722,901,435,000 cu. ft. Hussey said the 1956 output included 1,606,641,353,000 cu. ft. of natural gas and 336,058,122,000 cu. ft. of casinghead gas.



KING-SIZED CAMERA scores a hit with oil companies by giving them . . .

Faster, Cheaper Log Copying

DALLAS.—A unique type of camera appears to have found a home in the oil industry.

It isn't the type of camera you take along on vacations.

It's 3 ft. high and about 5 ft. long. It can make a picture 1,000 ft. long and 18 in. wide at a rate of 6 ft. a minute.

Such talents have interested oil operators in the device as a means of copying long, unwieldy seismic records and well logs.

Equipment formerly used, and still used in many places, was bulky. The process was slow and cumbersome. And the results often were not satisfactory.

A 60-ft. log, for instance, had to be mounted on a 14 or 15-ft. vacuum frame, photographed in pieces, and the pieces of copy painstakingly glued together.

The job of matching and splicing the log copy took a lot more time and manpower usually than the actual photographing. Splicing wasn't always accurate.

The new device, made by Reproduction Equipment Co., Dallas, has the advantages of being more accurate, much faster, and cheaper. It is claimed to cut labor costs up to 75 per cent and save on paper and film.

Along with these benefits, the camera shoots any size material and doesn't require an experienced operator.

An irritation to oil operators is that their logs after some use stretch and get off scale. Regular log paper is the worst culprit, but the original film stretches, too. The new device dispenses with this problem in that it can adjust and correct the copy back to the original scale.

A twin processing unit can be bought with the camera. The unit develops, "fixes," neutralizes, and dries the sensitized paper or film.

The package operates off ordinary 110/220-volt current. It can be installed on any type floor and needs no darkroom facilities or special plumbing.

The package is priced at $8,500. Bought separately, the camera and processor each are tagged at $4,650.

How it works . . . The camera is not a movie camera. It has no shutter. The key to the operation is that movement of the subject and of the film or paper photo or copy is at the same speed.

This has the net effect of taking a simple picture with neither the film nor the subject moving.

Light reflects from the subject through a prism, a lens, and finally the photosensitive film or paper.

Gaining ground . . . The camera actually isn't new. The first model was sold in 1947 to Arabian American Oil Co. and is still in use.

All told, Reproduction Equipment has sold 55, all but one of which is doing log-copying work. Buyers are oil companies, geophysical contractors, and reproduction firms.

Oil company owners include: Humble Oil & Refining Co., The Texas Co., Gulf Oil Corp., Standard Oil Co. of California, Union Producing Co., and Imperial Oil, Ltd. Others are El Paso Natural Gas Co., Petroleos Mexicanos, and DeGolyer & MacNaughton.

The camera, however, is just now becoming known by the industry generally. Reproduction Equipment last July issued a nonexclusive license to the Remington-Rand Division of Sperry Rand Corp. to market the unit nationally.

Other functions . . . When not copying logs with the unit, operators are using it for routine photo-copying work. Here, too, the unit is claimed to be faster and cheaper.

It produces an 8½-by-11 photocopy at an average cost of about 10 cents. A commercial photocopy service charges about 70 cents.

The manufacturer is looking for more jobs for the units in the oil patch.

One such job is figuring correct vertical depths of holes slant-drilled either from land locations or from over-water platforms. The deviation angle usually fluctuates during such drilling. And figuring correct vertical depth is a chore which may sometimes consume several days.

Using the same camera but with a modified drive, Reproduction Equipment can run through a log of a slant-drilled hole and distort it to come up with a correct vertical version in about 2 minutes.

Changes in the hole's deviation angle are read into the camera simply by twisting a dial.

Shell Buys Sewage Effluent

KIMBALL, Neb.—Shell Oil Co. has been awarded a 3-year option to buy sewage-plant disposal water from the city of Kimball for use in secondary recovery in the Southwest Potter field.

Shell will pay $500 annually for 3 years for the option. After that period, or as soon as Shell starts using the water, the minimum payment will be $3,500 annually for 1,440,000 bbl. and ¼ cent a barrel for all additional amounts. The franchise runs for 25 years.

A similar Shell proposal is pending with Sterling, Colo. Sterling dumps 600,000 gal. of sewage water daily into the South Platte River.

West Texas Frac Job Sets New Record

MIDLAND.—A dusty field outside Midland last week looked like the site of a miniature county fair. All the activity centered around Tennessee Gas Transmission Co.'s 1 Thomas. In the center of a ring of equipment, the big attraction was being staged—the world's largest fracturing job.

T.G.T. pumped 328,000 gal. of water and 225,000 lb. of sand into the well. This tremendous volume set a record for hydraulic fracturing jobs that should stand for a long time.

It eclipsed by far the record set last summer by Hanley Co., Fort Worth. Hanley pumped 250,000 gal. of water and 200,000 lb. of sand into one of its wells in the Spraberry trend area *(The Oil and Gas Journal, July 30, 1956, page 123)*.

For the job on Tennessee's 1 Thomas, in Vealmoor field, Dowell Incorporated brought 28 pieces of equipment and 41 engineers and operators to the well. Actual pumping time was 1 hour and 50 minutes—an average of 71 bbl. per minute against 3,500 psi. surface working pressure. Gross horsepower at the site was over 15,000; hydraulic horsepower during fracturing was 6,250.

The 328,000 gal. of water had to be hauled to the well site beforehand. It was stored in two swimming-pool-size pits lined with polyethylene film. Each pit was 50 ft. wide by 70 ft. long, and 7 ft. deep.

The formation getting the record frac volume is the Dean sand of Permian age and lying just beneath the Spraberry sand. In the 1 Thomas, the Dean sand lies at about 8,200 ft.

HERE'S THE WORK of 28 pieces of equipment and 41 engineers.

Not just water . . . Dowell mixed and pumped into the well with the fracturing water 534 gal. of a demulsifier. This is intended to prevent any water or emulsion block in the formation that might damage productivity. Also, 7,500 gal. of a fluid-loss control agent went into the frac fluid. A low fluid loss prevents rapid filtration of the water out of the fracture and into the formation. Too rapid water loss cuts down on the size and extent of the fracture, besides adding to the danger of a premature "sand out."

So that not all of the fracturing water would leave the well through the same set of perforations, Tennessee injected neophrene-coated nylon balls into the well. Two hundred of the balls went into the well in two stages.

Putting up power for the job were 8 of Dowell's Allison aircraft-engine pumpers. In addition there was a new style electric pumper with a 1,200-hp. Rolls-Royce Merlin aircraft engine. This engine drives a 1,440-kw. generator which supplies electric power to two high-speed, high-volume pumps

driven by electric motors. A truck-engine-powered pumper injected the sealer balls.

Besides the 10 pump trucks there were 2 sand-water blenders, 2 fire trucks, 2 equipment trucks, a 3,000-gal. mixer, a 10,000-gal. mixer, and a gasoline transport.

The 71-bbl. per minute pumping rate is fast even for the smaller-volume but high-rate jobs done in the Spraberry trend and elsewhere. High injection rate should insure the widest fracture extent possible as well as preventing a sand out by keeping the sand well mixed with the water.

When Hanley Co. fractured the Spraberry well last summer with 250,000 gal., at least two 80-acre offset operators got slight production increases. At Hanley's well, however, the fluid was all pumped in stages. It did not have sealer balls to break injection and create multiple fractures as did the Tennessee well. It appears likely that the big frac job on Hanley's well and another like-sized job in the Spraberry will pay out.

New Grants Studied

Government may let blocks in disputed tidelands area

WASHINGTON.—Another sale of oil and gas leases in the outer Continental Shelf is under study in the Bureau of Land Management.

The bureau has outlined areas in the Gulf of Mexico which may be put up for bids within the next 4 months, it was disclosed by Director Edward Woozley. He estimated that about $72,000,000 would be secured in bonuses on these leases.

Woozley, testifying before a House appropriations subcommittee, did not indicate whether the leases would be in the outer zone of the disputed area off Louisiana on which development was halted last year by Supreme Court order. But this would be the likely area.

An interim agreement reached last October paved the way for resuming activities while the suit over Louisiana's boundary hangs fire in the Supreme Court. The zone in which new federal leases might be offered lies beyond the disputed area and there has never been any question of the federal Government's title.

Woozley disclosed that the Government is not getting any substantial revenue from royalties on Continental Shelf production. But he said it has collected over $250,000,000 in bonuses and rentals.

Shell Nears TCP-Patent Goal

WASHINGTON. — It appears that Shell will get a patent on its TCP gasoline additive.

On February 14, the U. S. Patent Department was overruled in a U.S. District Court decision here which held that two Shell Development Co. men were entitled to the patent they had sought.

Tricresyl phospate has found fairly wide use in motor gasoline since Shell introduced it in 1953. A number of other companies have blended TCP and other private compounds containing TCP. Shell estimates that 10 billion gallons have been marketed in this country. Many more billions of gallons have been sold abroad.

Just what the outcome of this ruling will be is not yet clear. Shell is saying nothing on that score at present. While it would appear highly unlikely that the court ruling will be upset, Shell's legal standing is not considered clearly defined until the patent is actually issued.

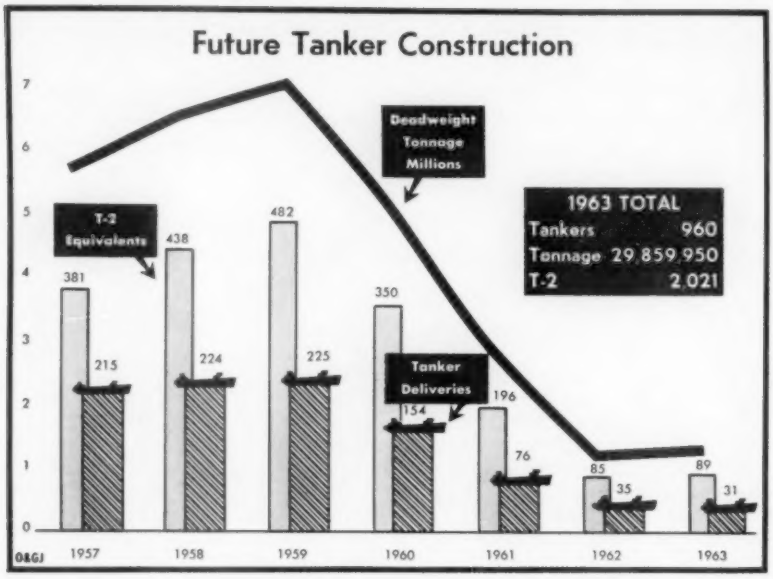
Important discovery . . . In reversing the patent department's stand, Judge Alexander Holtzoff said tests have shown that a TCP additive "substantially reduced fouling of spark plugs and helped cure some of the difficulties, especially in connection with airplane engines."

He ruled there would seem to be no doubt that the inventors in this case made an important discovery, namely the ability to eliminate or at least substantially reduce the fouling of spark plugs by the addition of chemicals to gasoline fuels containing tetraethyl lead.

In the court's opinion, the forward step taken by these inventors was far from obvious. It took a couple of years of experimental work on the part of a group of trained men to arrive at a solution. The two inventors, Venard Yust and John L. Bame, carried on their work at Shell's Wood River, Ill., research laboratory.

Once the patent is duly issued, Shell is expected to state its position on licensing and royalty. The matter concerns tricresyl phosphate specifically and the ruling is not considered applicable to other phosphorus compounds which are being compounded with motor fuel.

New Barge Off to Work: Kerr-McGee's newly completed Rig 47 has been put to work under contract to Phillips Petroleum Co. The rig will try its sea legs in Block 129-A of the Eugene Island area—off Saint Mary Parish, Louisiana. The barge is identical to Kermac's Rig 46, commissioned in October, as the world's tallest floating structure *(The Oil and Gas Journal, October 29, 1956, page 64)*. Rig 47 can operate in depths up to 70 ft. It measures 242 by 202 ft. and has a weight of 5,000 tons on bottom.



Why the Boom in Tankers?

● New tonnage usually parallels oil demand but now it's outstripping demand; the reason: World is turning to oil fields farther and farther away from big markets

THE size of the world's tanker fleet jumped 8 per cent in 1956. This increase—140 vessels and 3,346,532 dwt.—will be dwarfed this year, next year, the next, and the next.

During each of the next 4 years, builders will launch an average of more than 200 tankers. A yearly average of more than 6,000,000 dwt. will be added to the fleet.

This is the prediction of John I. Jacobs & Co., Ltd., London shipping authority.

In the past, the growth in the world tanker fleet has tended to parallel the growth in oil demand. This growth is outstripping demand now, and it appears likely to continue. The reason:

Demand for oil that must be transported by sea over a long distance is growing faster than the demand for oil that can be carried overland or by short tanker routes.

A big factor in this trend is the use of huge supertankers to carry Middle East crude around the African cape, instead of through the Suez Canal.

And, too, more tanker capacity will be needed if exports of Middle Eastern crude to the United States increase after the Suez is reopened.

The chart above shows how Jacobs views future deliveries, and the equivalent in terms of the standard World War II T-2 tanker. The T-2 weighs 16,500 dwt. and is capable of 14.25 knots.

The 960 vessels building or on order total 29,859,950 dwt. This equals about 70 per cent of today's going fleet. At a possible cost of about $250 per ton, this means a staggering $7,500,000,000 will go into the construction of tankers in this period.

The growth in size is outdistancing the growth in numbers. That's because of the marked trend to supertankers. In its annual tanker review, Jacobs notes that at least one tanker of 106,500 dwt. and two others of 100,000 dwt. have been ordered in the United States. There is also talk of a 120,000 tonner.

This growth in size is illustrated by comparing supertankers now afloat with those building or planned:

Size (1,000 tons)	Afloat (1,000 tons) No.	Afloat (1,000 tons) Total	On order No.	On order Total
24-30	188	5,053	93	2,447
30-35	103	3,288	191	6,232
35-40	20	764	119	4,446
40-45	3	126	69	2,809
45-50	7	323	116	5,317
50-60			9	465
60-75			17	1,090
75 and over	1	86	8	763
Total	322	9,640	622	23,569

Atomic energy . . . The future supertanker may be powered by a competitive fuel.

Dr. Paul F. Genachte of the Chase Manhattan Bank says that "one certain use of nuclear reactors will be in oil tankers.

"Their high load factors will make nuclear power competitive sooner than would be the case in other types."

He also said "it is not impossible that all vessels built after 1960 will be nuclear powered," a development that would mean the gradual loss of a big market for heavy fuel.

Companies not in the oil industry are increasing their share of the world tanker fleet. At the end of 1956, they owned 1,327 tankers, totaling 22,655,462 dwt. This compares with 1,185 oil-company ships totaling 17,305,727 dwt.

How the World Fleet Is Distributed

Country—	1956 No.	1956 Tonnage	1955 No.	1955 Tonnage
United States	505	7,954,985	520	8,130,035
British	555	7,823,750	537	7,479,279
Norwegian	407	6,663,681	399	6,295,372
Liberian	253	5,827,201	185	4,104,598
Panamanian	176	3,160,556	184	3,169,043
French	118	2,002,295	114	1,881,538
Italian	125	1,897,802	119	1,770,467
Dutch	122	1,514,043	115	1,376,447
Swedish	83	1,348,534	77	1,240,534
Japanese	63	1,085,749	57	944,716
Danish	49	835,133	47	789,293
Russian	63	572,816	43	361,316
German	35	483,773	33	413,621
Argentine	47	443,212	46	435,307
Spanish	35	343,439	32	287,379
Canadian	46	284,732	46	283,782
Greek	17	240,278	18	254,622
Brazilian	16	229,800	14	223,800
Finnish	15	214,140	14	196,915
Honduran	10	211,965	11	226,549
Other	121	1,239,460	121	1,166,099
Total	2,862	44,377,344	2,732	41,030,812

Texaco Adds "Brain"

I.B.M. unit has capacity of 25,000 mathematicians

HOUSTON.—The Texas Co. is installing one of the world's largest "electronic brains" here to help solve current operating problems and guide future expansion.

The unit is an I.B.M. 705 electronic data-processing system. It will be the first of its kind in Houston. Throughout the world there are only 110 such units in operation.

Texaco and International Business Machines Corp., makers of the unit, have spent more than 2 years planning and preparing for the computer.

The electronic system will occupy about 4,000 sq. ft. on the main floor of The Texas Co.'s division office building here. Temperature and humidity of the room will be carefully controlled to permit the big brain to work at peak efficiency. Sidewalk spectators can watch the system at work through thermopane windows.

The unit's "brainpower" is rated at that of 25,000 highly trained mathematicians. The 705 will give an answer to a production problem which would require an accountant 2 days to solve with a mechanical calculator.

Texaco officials said the computer will be able to solve within minutes such complex questions as:

. . . How geological structures can be pinpointed for most favorable drilling.

. . . The day-to-day status of Texaco's crude reserves.

. . . Which mix of available crudes, and rate of operation of various refining units will yield optimum type and volume of products?

Tidelands Attract New Offers

HERMOSA BEACH, Calif.—City officials are studying two proposals for development of the tidelands here.

One offer is from a four-company group composed of Bandini Petroleum Co., Southern California Petroleum Co., Anderson-Prichard Oil Corp., and Climax Molybdenum Co. It includes a cash advance of $500,000 for rental of an offshore drill site, and a sliding royalty rate ranging from 18 to 50 per cent of the gross sale price of the crude, depending on the output.

This proposal is almost the same as the 1955 contract granted to three oil companies for development of tidelands at neighboring Redondo Beach.

The other Hermosa Beach proposal is by Ramona Oil Co. It includes an outright gift of $500,000, a net 20 per cent royalty on production, and 50 per cent of the net profits.

Pipeline briefs

Pacific Gas & Electric Co. plans to complete looping of its 502-mile 34-in. pipeline from Milpitas on the San Francisco Bay to Topock, Ariz., by the end of this year. Only 138 miles of the line has not been looped.

P.G.&E. has approval of the California Public Utilities Board to loop 64½ miles of this segment and last week sought permission to loop the final 73½ miles. Cost of the 73½-mile loop will be $9.3 million. The Topock-Milpitas system, completed in 1950 with 140,000,000 cu. ft. daily capacity, will be able to transport 1,250,000,000 cu. ft. daily when looping is completed.

Cia. Shell de Venezuela is laying a big-inch crude line from wells in Lake Maracaibo to Cabimas. Brown & Root, Inc., is handling the submarine job, which will be completed in April.

A 19-mile, 20-in. line is the central part of the project. Some 4½ miles from shore it will be joined by 20 and 16-in. lines extending from a 1½-mile, 24-in. submarine loading line.

Some 3,000 bbl. daily of light crude is being pumped through the newly completed Trans-Prairie Pipelines, Ltd., system to Midale, Sask. There the crude is taken by Westspur Pipe Lines, Ltd., for shipment to the Interprovincial and Minnesota pipelines.

Cities Service Gas Co. is laying 151 miles of 4 to 16-in. gas lines, mostly in field gathering systems in Kansas, Oklahoma, and Missouri. Vaughan & Taylor Construction Co., Odessa, Tex., is building lines in Barber County, Kansas, and in Eureka field, Oklahoma. Prairie Construction Co. has the contract for work at Sarcoxie, Mo.

Humble Pipe Line Co. was scheduled to complete a 94-mile, 18-in. crude line from its Ector station to the Kemper station in West Texas last week. Lone Star Constructors had the contract for the line. It will enable Humble to deliver 120,000 bbl. daily from Ector County into its system to the Gulf Coast.

Texas Power & Light Co. will lay 58 miles of 8-in. gas line from Groesbeck to Grapeland, Tex. Panama, Inc., Houston, has the contract for this project, to be finished March 15.

O. R. Burden Construction Corp. will complete 14,000 ft. of 12 and 16-in. for Great Lakes Pipe Line Co. at Tulsa this week. The line will pick up products from The Texas Co. refinery in West Tulsa.

Southern Natural Gas Co. plans to lay 94 miles of 6, 8, 10, and 12-in. to tap new supplies of gas in Louisiana this year. The various projects are either before the Federal Power Commission or will be submitted soon. The program is to be completed by December 1.

Eastern Pipeline Contractors, Dallas, will build a 90-mile feeder line from Gulf Oil Corp.'s Eunice, N. M., gasoline plant to Midland, Tex. The line will deliver raw products into a Gulf line now being built from West Texas to the Houston area. The feeder line will be 6 and 8-in. Eastern has begun right-of-way and ditch work. Pipe laying will start within a week and the project will be completed about 45 days later.

Ohio Fuel Gas Co. will spend $2,070,000 developing its McArthur storage field under a certificate issued by the Federal Power Commission. The company will inject up to 85,000,000 cu. ft. daily next year. The storage will be able to supply 70,000,000 cu. ft. daily by 1959 to meet peak winter demand.

Also for Pipeliners . . .

The FPC is asking Congress to set up commodity-value standards for pricing natural gas (P. 92) . . . Alberta Gas Trunk Line is budgeting $10.8 million this year in a 4-year program to supply Trans-Canada with gas (P. 93) . . . Work will start on gathering system in Oklahoma's Mocane area for Colorado Interstate (P. 94) . . . Mid-Continent Pipe Line is moving toward an automatic system. Its new control board remotely dispatches over the 3,000-mile gathering line . . . Trans Mountain will loop 100 miles of its crude line from Edmonton to Washington this year (P. 95) . . . A 1,000-mile gas pipeline may solve France's fuel worries. The proposed line would link Lacq gas field with Paris (P. 98) . . . Pakistan's gas worries also are nearly over. A 145-mile line is being talked to link Sylhet field to Dacca (P. 100).

PLUS THESE TECHNICAL FEATURES: Satellite, push-button stations will make Evangeline Products System fully automatic. They are part of a new multiphase expansion (P. 111) . . . and Pipeline Patrol shows how to simplify those right-of-way problems. Part two of a series (P. 157).

Gas-Price Formula Urged

● FPC asks Congress to set up commodity value standard; it tops long list of changes sought in Natural Gas Act

WASHINGTON. — A "commodity value" standard for pricing natural gas was urged on Congress last week by the Federal Power Commission.

This and the need for a sharp line between gas and oil operations were emphasized in a long list of changes in the Natural Gas Act sought by the FPC in its annual report.

The commission did not call for exemption of producers from federal control. It was already on record, however, as favoring it in 1955 when the Harris bill was before Congress. And President Eisenhower already has raised the question again this year. He called for exemption in his annual budget message *(The Oil and Gas Journal, January 21, page 61).*

The changes outlined by the FPC, in the absence of decontrol, would relax much of the pressure of regulation.

What's involved . . . The suggested standard for pricing gas as a commodity would not require the use of a rate base or the usual utility rate-making principles.

It would enable the FPC "to weigh the interests of the consumer in low prices with the necessity of providing assurance of future gas supplies," Congress was told.

The commodity standard would apply to pipelines as well as to independent producers.

The FPC also urged that no consideration be given to oil and other by-products obtained through natural-gas production. Heretofore, the commission was forced in rate cases to determine costs and revenues of these byproducts.

It recommended that independent producers should not be required to seek certificates of public convenience and necessity. Their contracts with pipelines also should not carry spiral escalation clauses or favored-nation clauses.

Commissioner William R. Connole concurred in these recommendations, but with reservations. He said the law should not be rewritten to limit the FPC's right to consider costs and revenue requirements where necessary. If costs could not be used, it would restrict consideration to the demand for gas. It would eliminate consideration of the cost of gas and ignore an essential element of reasonable value, he explained.

And if the FPC could not consider cost, the producing industry would be deprived of a constitutional protection against confiscation which all other natural gas companies enjoy.

Other points . . . A number of other suggestions, some of them offered before, made in the report included:

. . . Security issues of natural-gas pipelines should be passed on by the FPC.

. . . Emergency interconnections should be required of pipelines with the FPC setting the terms, arrangements, and conditions and the compensation to be paid.

. . . Voluntary interconnections on a permanent basis should be allowed for emergency use when asked by the commission.

. . . Broad investigatory powers over the gas industry should be retained by the commission similar to authority over the electric industry given it by the Federal Power Act.

. . . Imports and exports of natural gas should be brought under the Natural Gas Act. Persons engaged in import and export should be defined as natural-gas companies so far as their operations in the U. S. are concerned.

. . . Authority to suspend rate schedules covering industrial sales should be given the commission.

. . . Right to increase rates where necessary to correct undue discrimination and to allocate gas among customers in periods of shortages should be given the commission.

. . . Permissive hearings on curtailment or abandonment of service should be allowed instead of mandatory ones.

. . . Transfer of gas reserves that are part of a pipeline company's bases for certification should first have FPC approval.

New standards . . . A number of changes were suggested in section 7 (c):

Due notice and opportunity for hear-

Leduc Has Birthday: Two men connected with the discovery of 1 Leduc, one of the most important strikes in Canadian history, congratulated themselves recently at the well's tenth-anniversary celebration, which attracted a host of Canadian dignitaries. Mike Turta, left, owns the farm where 1 Leduc was drilled. J. R. White, right, is president of Imperial Oil Co., Ltd., which drilled the discovery. Turta was presented a driller's hat and made an honorary roughneck by the Canadian Petroleum Association. White donned a "10 gal." ranch-style hat for the occasion.

ing would be substituted for the mandatory hearings. The FPC would be given control over allocation of gas when required for national defense or to safeguard supply in emergencies. Certificates should not be required when a person merely building facilities will not become a natural-gas company. An example is the lease or sale of interstate facilities.

It was also recommended that the FPC be given the right to set safety regulations for the operation of interstate pipelines.

Independent-producer regulations is setting problems which the FPC is trying to solve as fast as possible, Congress was told. The methods and standards are being set up through case-by-case hearings.

"Inasmuch as the regulation of independent-producer rates is a new and vastly complicated undertaking, it is felt that any predetermined standards arbitrarily fixed at this time would, in all probability, require substantial revision at a later date, thereby leading to confusion and instability."

The report showed that during the fiscal year ended last June 30 the FPC disposed of 3,003 certificate applications and 4,332 rate filings. At the end of the year 199 producer rate increases, totalling $17,793,000 a year, were pending.

Certificates for 164 projects for $461,413,000 in facilities were issued to pipelines. A total of 893 rate filings was received, of which 31, involving $134,200,000 a year, were pending June 30.

Alberta Gas Project Outlined

CALGARY.—Alberta Gas Trunk Line Co., Ltd., will spend $10,835,105 this year in its 4-year program to provide Trans-Canada Pipe Lines, Ltd., with natural gas.

The company has agreed to gather and transport 620,000,000 cu. ft. daily to the Alberta-Saskatchewan border by the end of 1960. Over a 4-year period the gathering system will cost $54,000,000. The company has arranged to raise an initial $12,750,000 by sale of 2,552,230 Class A common shares through investment houses in Alberta.

The 1957 project will connect the Bindloss and Provost fields to the main line. Pipe will be laid as soon as frost is out of the ground, probably around May. The Red Deer River crossing is nearing completion, and work will start soon on the 1,000-ft. South Saskatchewan River aerial crossing.

Steel mills in the U. S. will supply the big pipe. Anything of 11 in. or under will be produced in the Edmonton plant of Alberta Phoenix Pipe & Tube Co.

Big Storm Left Few Clues

● Offshore operators get hints on how to protect barges against another "25-year storm" like Hurricane Flossy

HOUSTON.—Last autumn's hurricane Flossy was a dilly of a storm, but it didn't tell oil men how to build a better offshore platform.

It cost the oil industry several million dollars, but it left few clues to what the next hurricane might bring.

This is the conclusion of John C. Freeman, Jr., meteorologist, and Herman Gade, oceanographer, both of Gulf Consultants, Houston. Their study of the winds, tides, waves, and wave forces in last year's worst storm in the Gulf of Mexico was presented here at a meeting of Society of Naval Architects and Marine Engineers.

The storm had many "interesting" aspects to scientists, but it apparently added "only a minute amount of scientific information" to help prevent and anticipate damage from future hurricanes.

Flossy was rated as a "25-year storm." In other words, a storm of its severity is expected along any 100-mile section of the coastline only once in 25 years.

Since most offshore drilling units are built to withstand a storm of this intensity, you might assume they're safe for another 24 years. But that's not necessarily the case. The next 25-year storm might come in 1 year or it might not come for 25 years.

Further complicating the task of trying to forecast hurricanes is the fact that a 25-year storm occurs somewhere in the Gulf of Mexico about every 2 or 3 years.

Mathematically, there is one chance in four that a 25-year storm might also be a whopper earning the rating of a 100-year storm. There are few structures in the gulf designed to withstand a storm of such intensity. Flossy met few drilling rigs headon, but at least one of those in the edge of the storm almost capsized.

Who was hurt . . . A detailed report of Flossy's damage to several offshore drilling units was presented in a paper by J. R. Graham and J. E. Pike. Graham is with Christenson & Graham, Inc., civil and marine engineering firm of Pasadena, Tex. Pike is a Houston insurance agent representing Lloyds of London for offshore drilling equipment.

They reported the new barge owned by Morris & Hamilton, Inc., moved about 40 ft. off location and buried its slot end 34 ft. below the surface. The badly damaged barge nearly capsized at one time but was salvaged after 4 days.

Rigs 40 and 44 of Kerr-McGee Oil Industries, Inc., were abandoned during the storm. They settled into the bottom of the gulf, and their topsides were damaged by collision with the wellheads.

Phillips Petroleum Co.'s Rig 42, which had just moved to location in the Mississippi Delta area, was abandoned. The storm moved the barge about 500 ft. and the crew quarters were severely damaged.

Recommendations . . . Graham and Pike offered several suggestions to reduce damage from future storms:

. . . Spudding or piling arrangements to hold the barge in place.

. . . Cofferdams around slotted barges operating in the open sea. These are intended to reduce damage in case of collision with the jacket.

. . . Efficient communications systems connecting shore bases, weather bureau, tug boats, and other marine equipment.

Oklahoma Well Hits

Phillips success opens up production in wildcat area

BARTLESVILLE.—Phillips Petroleum Co. is completing the most significant oil discovery in the Hugoton embayment this year. The well is the 1 Blakemore, a rank wildcat in Beaver County, Oklahoma.

The discovery flowed 292 bbl. of 36.1°-gravity oil in 8½ hours on 1-in. choke. Perforations are in the Chester-Mississippian at 6,542-63 ft. The well is 8 miles northwest of the nearest production at Southeast Boyd field in Beaver County.

One of the few Chester oil strikes in the Oklahoma Panhandle, the well opens up production potential in western Beaver County. Most production from the Chester in this area is gas and gas distillate.

Phillips' discovery is about 15 miles east of the vast Guymon-Hugoton Permian gas field. The company is moving in a rig to drill the 2 Blakemore. This offset will go to 6,700 ft.

Nearly a dozen important oil strikes have been made this year in the Oklahoma Panhandle, but there is no other drilling in the immediate area of 1 Blakemore.

Sinclair Will Talk Wages

Oil industry to get preview of 1957 labor picture when Sinclair sits down with powerful O.C.A.W. February 28

KANSAS CITY.—Wage talks between Sinclair Oil Corp. and the Oil, Chemical, and Atomic Workers International Union this week may set the general oil-industry wage pattern for 1957.

Sinclair and the union will meet here February 28. The meeting has already helped smooth out ruffled relations between Sinclair and the big 105,000-member O.C.A.W.

The meeting is important in the overall oil-labor picture. Sinclair's labor contract is the largest and only nationwide contract in the industry. It involves 15,000 Sinclair production, pipeline, and refinery employes.

Here are the events that led to the February 28 meeting date:

. . . A 27-cent-an-hour wage hike was demanded for all 105,000 O.C.A.W. members when the union's powerful bargaining policy committee met last December 7.

Current wage scale in the industry ranges from $2.57 to $2.67 per hour. Most of the union's contracts with oil companies are opening for wage talks this month and next.

. . . Sinclair refused to talk wages with the union early in January. This brought a quick reaction from the union.

. . . A strike threat was thrown into the picture by O.C.A.W. President O. A. Knight. He said that if Sinclair wouldn't agree to a conference, the union would have no alternative to calling a strike vote.

Expiration of Sinclair's contract June 15 gives the union its first opporunity in 5 years to demand improvements in such items as retirement, hospital and surgical programs, vacations, and holidays.

Shortly after the strike threat, Sinclair agreed to the February 28 meeting.

Other dealings . . . Knight said negotiations are continuing with other companies, but so far there have been no "concrete developments."

Standard Oil Co. (Ind.) offered an hourly wage increase of 3 per cent or about 8 cents. This was rejected late in January by the O.C.A.W. and also by the year-old Federation of Independent Oil Unions.

Two Federation affiliates — Central States Petroleum Union and Independent Petroleum Workers of America — represent the majority of Indiana Standard employes. Only a handful of O.C.A.W. members are involved in the negotiations.

It was Indiana Standard that set the pace in 1956 when the oil workers were granted a 6 per cent, or 15-cent-an-hour increase.

Pipeline Buys Gas

Colorado Interstate pays 15 cents in Mocane area

BEAVER, Okla.—Construction will start next week on a gathering system which will link reserves under several thousand acres of the Mocane area to the Colorado Interstate Gas Co. system.

Panama, Inc., of Houston, has the contract to lay 139 miles of 4 to 24-in. pipeline between the Mocane area of the Oklahoma Panhandle and Hooker, Okla. The project is to be finished by May 15 and first gas deliveries are scheduled for June 1.

Colorado Interstate will take 25,000,000 cu. ft. daily from Mocane this year. This amount will be doubled the first of next year.

Colorado Interstate has contracted with Cities Service Oil Co. for reserves under an additional 30,000 acres in Mocane and Southwest Camp Creek for 15 cents per M.c.f. Reserves under 88,000 acres in the area have been dedicated to the pipeline by Kerr-McGee Oil Industries, Inc., Cities Service, Pure Oil Co., Cabot Carbon Co., United Producing Co., Lion Oil Co., The Texas Co., Champlin Oil & Refining Co., and Earl F. Wakefield.

Colorado Interstate has also obtained reserves under 25,000 acres in the Adams Ranch area of Mead County, Kansas, adjoining Mocane on the north.

New Refining Feature Starts in This Issue

TURN to page 140 for the first refinery construction report—a new Journal feature that will keep you posted on refinery building in the U. S. and Canada.

This week's report covers refinery construction on the West Coast. The report is divided into four units: West Coast, East Coast, Mid-Continent, and Gulf Coast. All except the Gulf Coast unit will cover a section of Canada.

Three issues each year will bring you a complete report on all four units. One issue will give you the complete Canadian report. You'll find this new feature each month in the last issue of the month.

Royalty Law Upheld

Montana officials beaten in attempt to hike share

HELENA, Mont.—The Montana Supreme Court has overruled state officials and upheld the constitutionality of a 1951 law setting a 12½ per cent royalty on oil and gas produced from state-owned lands.

The court ruled last week in an appeal by Arnold H. Olsen, attorney general and state land board member. Olsen appealed from a Helena District Court injunction preventing the board from leasing four Fallon County tracts near proven production for 16⅔ per cent royalty.

The judges rejected Olsen's contentions that the legislature has the authority to set minimum but not maximum royalty and that the board was not receiving full market value at 12½ per cent.

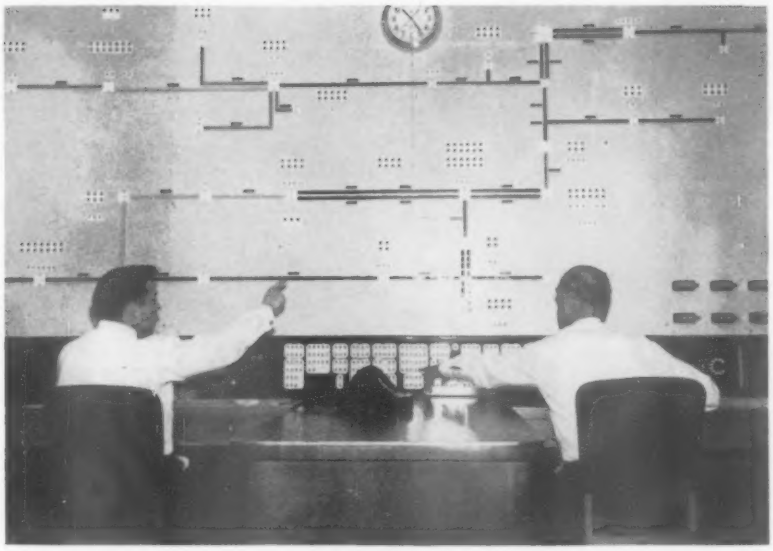
Under the 1951 law, the state receives 12½ per cent on the first 3,000 bbl. of oil produced a month. After that the state's royalty increases on a set scale, depending on additional production.

Meanwhile, a new bill has been introduced in the Montana Legislature to lift the 12½ per cent royalty and remove the limits on land rentals and nondrilling penalties. It is substantially the same measure killed by the state Senate earlier this month after the House had approved it.

Strike Vote at Bayway Fails

LINDEN, N. J.—A second strike vote called at Esso Standard Oil Co.'s Bayway refinery has failed to carry. The Independent Petroleum Workers Union voted 1,390 to 936 in favor of a strike, 170 votes short the required two-thirds of total membership.

A similar vote called last June showed roughly the same proportion. Basic salary rates are not an issue at Bayway refinery. The main points of disagreement involve seniority, arbitration procedures, use of outside contractors, and representation in grievances.



Mid-Continent goes automatic with . . .

. . . New Pipeline "Nerve" Center

TULSA.—One of the nation's largest crude-gathering systems is controlled from this dispatching board installed by Mid-Continent Pipe Line Co.

The board shows main lines of the 3,000-mile all-Oklahoma system, which transports 145,000 bbl. daily, principally to Duncan and Tulsa refineries of the pipeline's parent company, D-X Sunray Oil Co. All pumping units, stations, and tanks also are on the board.

Dispatchers Dave Billington (left) and Clarence Davis (right), sitting in Tulsa, can shut down 27 pumping units scattered from the Kansas border almost to Texas. Two of the units can be started up automatically.

Various types of crudes are designated on the board by colored lines. The board has direct-line communications to all main pumping stations. A teletype network also links Tulsa with field offices at Drumright, Seminole, and Wewoka.

Los Angeles Holds Up Harbor Leasing

LOS ANGELES. — Taking its cue from state legislature, the city of Los Angeles has decided to fall back and take another look at its tidelands leasing plans.

In a flurry of activity last week these events occurred to delay drilling on city-owned submerged lands:

. . . Mayor Norris Poulson set up a citizen's committee to study the leasing programs of various city agencies.

. . . The Harbor Commission called off plans to lease a 1,350-acre inner harbor parcel to Standard Oil Co. of California and three individuals.

. . . A lawsuit was filed asking the court to nullify a lease approved by the city council involving a 3,700-acre parcel in the outer harbor.

Mayor Poulson termed the city's leasing policies "makeshift and confusing." He asked the Harbor Commission to hold up leasing of harbor submerged lands until the six-man committee appointed by him could study the matter and submit its report.

Included on the mayor's committee are two oil men: Felix Chappellet, vice president and general manager of the Western Oil and Gas Association, and Stark Fox, executive vice president of the Oil Producers Agency of California.

The mayor also named a committee of two geologists and a petroleum engineer to study the subsidence danger from drilling on harbor lands. Los Angeles' inner and outer harbor areas adjoin Terminal Island, scene of severe and costly subsidence in recent years.

Poulson's request to the Harbor Commission asking it to suspend leasing on harbor acreage came at the same time the commission independently decided to do just that. The commission rescinded its previous lease to Standard of California, G. E. Kadane & Sons, Frank J. Waters and James J. Arditto on the inner harbor acreage.

The lawsuit was filed against Mayor Poulson, the city council and its members, and the Los Angeles Harbor Development Corp. It contends the acreage should have been put up for competitive bidding. It also charges the Harbor Development Corp. did not have a permit to sell stock and was not prepared to drill at the time the lease was awarded.

Looping Planned

Trans Mountain to loop 100 miles of crude line

VANCOUVER.—Trans Mountain Oil Pipe Line Co. will loop 100 miles of its 720-mile crude line from Edmonton to Washington this year.

Two 50-mile sections of 30-in. will be laid parallel to the original 24-in. line east of Kamloops, B. C., and west of Edson, Alta.

These loops, plus a permanent pump station and three temporary stations, will increase capacity to 240,000 bbl. per day. Additional pumping units are being added to stations at Edmonton, Edson, and Kamloops to serve increased demand of refineries in British Columbia and Washington and offshore shipments at Vancouver. Refinery expansions in the Pacific Northwest are expected to increase demand 150,000 bbl. daily in the next 3 years.

The rapid growth of deliveries of the 4-year-old system is shown by the increase from 157,000 bbl. daily in December to 189,000 bbl. daily in January.

Trans Mountain was designed for 300,000-bbl. daily ultimate capacity when saturated with pumping stations. However, it was decided to start looping before the horsepower limit was reached. The entire line will be looped later, if demand grows as expected. Throughputs of 400,000 to 500,000 bbl. daily are being mentioned within 5 years.

No Agreement Yet on Jet Fuel

NEW ORLEANS.—Jet fuel specifications are still up in the air. Committee D-2 of the American Society for Testing Materials failed to reach an agreement at its recent meeting here.

Up for consideration were two fuel types for commercial aircraft: JP and kerosine *(The Oil and Gas Journal, September 17, 1956, page 118)*. A.P.I. gravity ranges of 39-51 for turbine Fuel A and 45-57 for Fuel B met with no opposition. But opinions still differ on what should be laid down as heating values. Stability tests also met with dissention, mainly because of lack of any standard test method.

After 34 years on location:

Last Wooden Derrick Topples

LOS ANGELES.—Santa Fe Springs field has reached the end of an era.

While two recent strikes have opened up tremendous deep-pay potential, the shallow zones which brought fame to the 37-year-old field are beginning to peter out.

The result is the toppling derrick above. It's the last of about 200 wooden derricks which General Petroleum Corp. once owned in Santa Fe Springs. Along with a good many others, the derricks were crowded into an area of some 2 sq. miles.

The last of these relics was 1-A Santa Fe, which was shut down last August because production was no longer commercial. It had produced 909,200 bbl. of oil in nearly 34 years.

Initial production was 2,540 bbl. daily. It took 7 months, from April 23 to November 23, to drill the well to its production depth of 4,700 ft. The derrick was 122 ft. high and contained 40,000 board feet of lumber.

Like most of the other wooden derricks in the field, this one went up in 1923 when the first of two prolific early-day strikes started a hum of activity at Santa Fe Springs. The second big strike came in 1928. Between them, they left the field studded with wooden and steel derricks which later mingled with modern rigs.

What's ahead . . . Santa Fe Springs was actually opened in 1919, but there wasn't much activity until the big 1923 strike, which opened up a flow of production which all but flooded the nation's crude market. Since the field was discovered, it has produced more than half a billion barrels of oil, but shallow reserves are now down to less than 50,000,000 bbl.

Promise of new life came, however, when General Petroleum brought in Santa Fe's first deep well early last year. It was the 243 Santa Fe, which is producing 30.9°-gravity crude from around 9,000 ft. The well came in for 1,776 bbl. daily and touched off a big new drilling play. Until then, the deepest production was from less than 8,000 ft.

In December, another discovery more than ½ mile west heightened interest in Santa Fe Springs' deep zones. This one was Edward Nepple 1 SP-Pedro-Nepple, a fault-block discovery which flowed 34°-gravity crude at an initial rate of 720 bbl. daily. Slightly deeper than General Petroleum's discovery, the well is producing from 9,443-9,725 ft.

Sun Sues Niarchos

NEW YORK.—Sun Oil Co. last week filed suit for $150,000,000 damages against Stavros Niarchos and World Tankers Corp.

In a suit filed in the U. S. District Court of Southern New York, Sun charged Niarchos broke a contract to move 33,200 bbl. daily of Middle East crude to Sun's Marcus Hook, Pa., refinery. The contract became effective in May of 1955, Sun said, and has 4½ years more to run.

The $150,000,000, the company said, represents losses the company has suffered and will sustain. Tanker movements, it continued, were halted last November and Niarchos has refused to furnish a schedule of liftings since then.

New Company Goes Offshore

NEW ORLEANS. — Sea Drilling Corp. has been organized by American Marine Corp., New Orleans; D. D. Harrington, Amarillo; and Carl M. Loeb, Rhoades & Co., New York. The firm immediately announced plans to build two offshore drilling barges and convert an LST into a drilling tender at a combined cost of about $6,000,000.

S. F. Rowan, former vice president and general manager of American Tidelands, Inc., has been elected president and a director of the new company. Other directors are L. B. Durant, president of American Marine; Harrington, an independent oil producer; and T. L. Kempner, member of Carl M. Loeb, Rhoades & Co.

The first of the new drilling units is scheduled for delivery in April. The other two are to be completed by end of this year.

Oil Flow Hits 7-Year Low

LOS ANGELES.—California's crude production in January dipped to its lowest level since mid-1950.

The state's average daily output in January was 938,670 bbl. The last time California's production was less than 940,000 bbl. daily was in September 1950. At that time the state had 30,000 bbl. of heavy crude production shut in. Now those low gravity wells are on full production.

Tidelands Switched

Big Alabama acreage goes to Sterling in merger deal

TULSA.—Sterling Oil Co. of Oklahoma, Inc., Tulsa, has acquired title to one of the largest tidelands leases in the Gulf of Mexico. It consists of about 232,000 acres south of Citronelle oil field in the Mobile area of Alabama.

Sterling plans to start geophysical work on the block soon, preliminary to picking a drilling site. Sterling President Jesse E. True said he expected to start drilling within a year.

The Oklahoma company acquired the offshore acreage in a merger. Its wholly owned Mississippi Sound Development Co. was merged with Tidelands Development Corp. Mississippi Sound paid about $450,000, partly cash and partly stock, for Tidelands Development assets. These included the offshore tracts. The surviving company is called Mississippi Sound Tidelands Corp.

The original Tidelands Development firm was announced as successful bidder on the tract earlier this month *(The Oil and Gas Journal, February 11, page 65)*. Its bid was 50 cents an acre annually plus $5,000 bonus. Over a 5-year period this will total nearly $600,000. An additional $2 million is budgeted for development.

The tract extends from the Mississippi state line almost to Fort Morgan on the east and from the shore line 9 miles into the gulf. This puts about 92,000 acres of the tract within an area where the federal Government claims jurisdiction. Alabama plans to put revenue from the disputed tracts in escrow pending settlement of conflicting claims.

Processing briefs

Two refiners were granted certificates of necessity for expansion and modernization projects last week. The California Co. is expanding crude capacity at Perth Amboy, N. J. It was given a certificate allowing rapid writeoff on 65 per cent of $1,260,000. In Norwalk, Calif., Wilshire Oil Co. of Canada will write off 65 per cent of $2,735,000. It is building new catalytic reforming and hydrodesulfurization facilities.

Jefferson Chemical Co., Inc., has added a new petrochemical to production in commercial quantities. High purity anhydrous piperazine is now available in flake form for the first time. As compared with solid forms previously available, Jefferson's new product is easier to compound.

Goodrich - Gulf Chemicals, Inc., plans to convert its synthetic rubber plant at Institute, W. Va., to cold rubber. Capacity will be 50,000 tons per year. When purchased from the Government for $11 million a year ago, the plant was rated at 122,000 tons per year for GR-S type rubber. The revamp job will cost over $2 million, plus $1.5 million for new power facilities. The conversion will be finished by early 1958.

Southern Nitrogen Co., Inc., has begun production of its new 250-ton per day synthetic ammonia plant at Savannah, Ga. Nitrogen solution output will follow in March, and solid ammonium nitrate in April. The $14-million plant was dedicated by John R. Riley, company president, last week.

Commercial Solvents Corp. and Thermatomic Carbon Co., industrial neighbors in the Monroe field of North Louisiana, are proposing a merger.

Commercial Solvents would be the surviving company, offering Thermatomic stockholders 18 shares of C.S.C. stock for each Thermatomic share. C.S.C. now owns 68.7 per cent of outstanding Thermatomic stock. Stockholders of C.S.C. and Thermatomic will vote on the proposal early in April. Thermatomic makes furnace carbon black at Sterlington, La., and C.S.C. makes petrochemicals there and in Terre Haute, Ind.

California Research Corp. and Standard Oil Co. of California are well under way on an extensive laboratory and road-testing program with 12:1 compression ratio experimental cars. Object: To evaluate new 100-plus octane motor fuels and new improved lubes which affiliated refiners will be called on to provide motorists in the future. The 2-year program will burn up some 50,000 gal. of specially prepared gasoline.

Du Pont Co. will build a sulfuric-acid plant to replace an old one at Ecorse, Mich., on the Detroit River. The plant will be the sixth new unit in Du Pont's postwar modernization program of its sulfuric-acid manufacturing facilities. It will "substantially" expand capacity at Ecorse.

Construction on the new unit will start in March. Completion is expected early in 1958. Du Pont's output of sulfuric acid, a key building block in the chemical industry, will not be affected during the construction program. The old plant will continue in operation until the new one is on stream.

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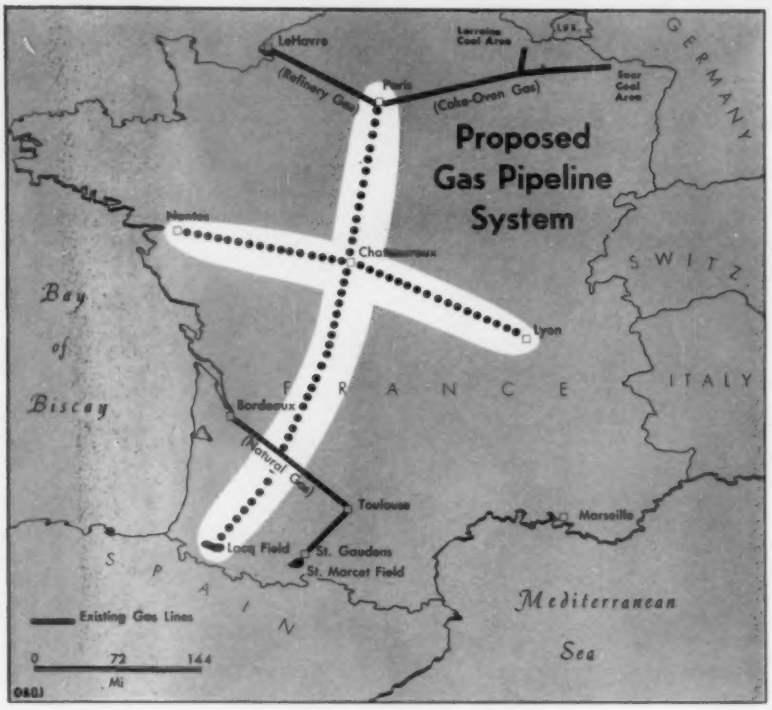
Also for Refiners . . .

Refiners are playing vital role in making more oil available for Europe. Their announced cuts in crude runs total about 200,000 bbl. daily. Switch in plant yields is helping even more (P. 78) . . . Kerr-McGee is adding a Platformer and Unifining unit at its Wynnewood refinery (P. 83) . . . Shell has won a court fight on its right to patent its TCP gasoline additive (P. 89) . . . Refinery wage patterns may start taking shape soon. Sinclair and O.C.A.W. officials will meet in Kansas City February 28 to discuss their nation-wide contract (P. 94) . . . Jet-fuel specifications are still up in air after a committee of the American Society for Testing Materials failed to reach agreement (P. 95) . . . Japanese refiners are moving into petrochemicals. Seven firms are getting plants under way this year (P. 99).

PLUS THESE TECHNICAL FEATURES: How Cosden uses a wide variety of processes to make a specialty of custom refining (P. 101) . . . The Ragatz process of rich-oil distillation proves itself in natural-gasoline-plant operation (P. 114) . . . A low-cost plan for designing and building smoke-control facilities (P. 116) . . . Phillips whips air-pollution problem at Texas ammonia plant (P. 129) . . . Refinery Construction Report, a new monthly feature, keeps you up-to-date on new techniques (P. 140) . . . The Foreman's page (P. 143) . . . Field Processing (P. 147) . . . and Cost-imating (P. 148).



France Gets Big Gas Line

It means that the Lacq field will give Paris her first natural gas to help relieve the recurring fuel problem

FRANCE'S acute fuel problem will be eased somewhat by a natural-gas pipeline system which will be built during the next 5 years.

Right-of-way work has already begun on the 1,000-mile system, which will transport gas from the vast Lacq field to Paris, Lyons, Nantes, and Chateauroux (see map). The pipeline will deliver gas next year, but it won't be brought to full capacity until 1960 or 1961. It will be built by Gaz de France, a combine of firms in which the government holds the majority of the stock under a postwar nationalization law.

The new source of natural gas, developed only slightly thus far, will supplement coke-oven and refinery gas which is now piped to Paris. And it will help to lessen dependence on fuel-oil imports from the Middle East.

What's planned . . . The 550-mile main line will run from Lacq field, at the foot of the Pyrenees Mountains near the Spanish border, to Paris.

The line will be 24-in. at the southern end and 16-in. the last 250 miles into Paris. A 12, 14, and 16-in. branch from Chateauroux will serve Lyon, and a 10-in. line will be built from Chateauroux to Nantes. The largest gas line ever laid in France is 12-in.

French contractors, using French pipe, will handle all construction.

A treating plant to remove sulfur, carbon dioxide, and liquids will be completed within 2 months. The plant will process 30,000,000 cu. ft. of raw gas daily. A second plant to process 120,000,000 cu. ft. daily is to be completed at the end of 1958.

Liquids production of the first plant will be 325 bbl. per day of butane and propane and 240 bbl. per day of natural gasoline. When the second plant goes on stream, L.P.G. output will total 1,825 bbl. per day and natural gasoline 1,200 bbl. per day, the French company estimates.

Handling the sour gas will be a major problem. It is 18 per cent H_2S and 12 per cent CO_2. Representatives of Gaz de France and Soc. Nationale de Petroles d'Aquitaine, which is developing the field, toured Canada and the United States this month to study construction, operation, and gas-handling problems. They were sponsored in Tulsa by T. D. Williamson, Inc., maker of special pipeline equipment in which the Frenchmen were interested.

One of the aims of the tour was to learn how much the gas must be sweetened and how to avoid hydrogen embrittlement of the pipe. But there is a brighter side to the problem, too. When gas production reaches its peak, sulfur recovery is expected to total 500,000 metric tons per year, enough to make France self-sufficient in this mineral.

Lacq reserves . . . Lacq is by far the biggest gas pool ever found in France.

It was discovered in 1953 by S.N.P.A. below the Lacq oil field, which was brought in 4 years earlier. The Lacq gas discovery blew out at 13,350 ft. *(The Oil and Gas Journal, December 7, 1953, page 85).* It was drilled to the Neocomien formation in the Upper Cretaceous, some 11,000 ft. deeper than the oil sands, which produced 3,300 bbl. daily last year.

Six gas wells of a 60 to 80-well program have been drilled in Lacq. Four more are now being put down. Reserves are estimated at 5 trillion cubic feet, and the field has not yet been defined. One of the four new locations is 5 miles west of the known field limits. If it hits, the French expect it to quadruple proved reserves.

Existing pipelines . . . There is only one natural-gas pipeline operating in France.

It extends from St. Marcet field, east of Lacq, to St. Gaudens, Toulouse, and Bordeaux. St. Marcet, discovered in 1939, is expected to be depleted in 10 years.

Part of Paris' fuel needs are being supplied by the two 12-in. pipelines—one from the steel and coal areas of Lorraine and the Saar in northeastern France, the other from LeHavre. The 350-mile line from Lorraine and the Saar transports 30,000,000 cu. ft. daily of coke-oven gas. The LeHavre line moves 6,000,000 cu. ft. daily of refinery gas.

Underground storage, the secret to meeting peak winter demand in the U. S., is available also near Paris. Coke-oven gas is being stored in the Beynes anticline, some 20 miles from the city. This reservoir will be used to store natural gas when the new system is completed. The French estimate its ultimate capacity at 12 billion cubic feet and its peak daily deliverability at 168 million cubic feet.

Nippon Refineries Boom

● Crude throughput increased 36.2 per cent last year; now seven processors are expanding into petrochemicals

JAPAN'S fast-growing refining industry, fresh from a 36.2 per cent gain in throughput last year, is now moving into petrochemicals.

Refiners on the island had crude runs averaging 205,000 bbl. daily in 1956. Further gains are expected this year. In fact, the government estimates total demand will increase 450 per cent by 1975.

Plant production from the stepped-up crude runs also was impressive. Fuel-oil output averaged 103,300 bbl. daily or 50.4 per cent of throughput. This represented a 44.6 per cent gain over the year before.

Yields of other leading products were: Gasoline, 52,400 bbl. daily; light oils, 15,300 bbl. daily; kerosine, 13,400 bbl. daily; and lubricating oils, 7,700 bbl. daily.

Other products, shrinkage, and refinery boiler fuel accounted for the remaining 12,900 bbl. daily.

Birth of petrochemicals . . . Japan's petrochemical industry will get off the ground this year.

At least seven companies have plants either under construction or approved by the government, which both protects and regulates the industry.

Until now there has been no commercial petrochemical production with one exception. Nippon Gas Chemical Industry Co. has made methanol and formaldehyde from domestic natural gas.

Two companies expect to start production of some petrochemicals in February. A subsidiary of Nippon Oil Refining Co. plans to make acetone and isopropyl alcohol. Maruzen Oil Co. expects to have output of secondary butanol and methyl ethyl ketone. Both plants will turn out other products later.

Three other firms hope to have products on the market by the end of the year. Mitsubishi Oil Co. will make benzene, toluene, and xylenes. Sumitomo Chemical will make polyethylene.

How they rank . . . Mitsui Chemical will have the biggest operation in the early stages of the industry.

It will produce benzene, toluene, polyethylene, ethylene glycol, ethylene oxide, phenol, acetone, sulfate of ammonia, and urea.

The Mitsui family was one of the two leading financial families in Japan before World War II. The other, the Mitsubishi family, also is going into the petrochemical business. Mitsubishi Yuka by the middle of 1958 expects to be producing ethylene oxide, polyethylene, ethylene glycol, styrene monomer, urea, and sulfate of ammonia. Other products will be produced later.

The seventh company, Furukawa-Showa Denko, expects to go into production in 1960.

Caspian Search to Expand

Russia plans a sharp increase in oil and gas exploration in Turkmenia during 1957.

Emphasis will be in the western portion near the Caspian Sea. Deep wildcats are scheduled in two new areas. Interest is particularly high around Kotur-Tepe, where a flowing oil discovery was made recently. The program will involve 25 geophysical crews

Turkmenia's oil production has risen steadily since the war. From about 4,400,000 bbl. in 1940, output rose to 15,000,000 bbl. in 1950, to 21,300,000 bbl. in 1954, and to 23,300,000 bbl. in 1955.

New Rig Going to Costa Rica

Union Oil Co. of California plans to bring a second drilling rig to Costa Rica within the next 2 months. The company's first rig currently is drilling the 3 Cocoles well in southern Costa Rica near the Panama border *(The Oil and Gas Journal, February 11, page 87).*

Union officials here said they plan to test drill an entirely different structure with the new rig. The structure will be near the seaport of Limon on the Caribbean where Union holds extensive exploration and exploitation rights.

Kern Oil May Change Hands

Rio Tinto Co., Ltd., of London, is in the market for Kern Oil Co., Ltd., large California oil producer.

Rio Tinto, with mining interests in Canada, Australia, Rhodesia and Spain, will expand its interest to oil if the deal is negotiated. The British-owned Kern Oil Co. produces 2,335,000 bbl. yearly. California is the company's leading producing area with 1,266,000 bbl. followed by Trinidad with 1,033,000 bbl. and 36,000 bbl. in Mexico.

Its subsidiary, Kern Trinidad Oilfields, Ltd., has leases in Trinidad including an offshore concession. Kern also holds an interest in 70,000 acres in California, Nevada, Colorado, Wyoming, Montana and Utah through St. Helens Petroleum Corp. of Los Angeles.

Germany Looks Up

Production expected to hit 80,300 bbl. daily by 1961

WEST GERMAN oil output will continue to rise for at least another 4 years. That's the latest forecast from West Germany's producers' association — Wirtschaftsverband Erdoelgewinnung.

Production in 1961 will average 80,300 bbl. daily, according to the group's annual prediction.

This year's output is expected to average 73,100 bbl. per day—a 7.5 per cent increase over last year. The 1958 forecast calls for 79,200 bbl. daily; and 1959, 79,400 bbl. Little increase is foreseen in 1960.

The big question mark is how much output can be expected from new discoveries. In 1961, the anticipated production is based on 82 per cent of the crude coming from fields now in operation, and 18 per cent from new areas.

Successful drilling operations in 1956 increased the potential in four provinces: Holstein-Hamburg, Weser-Ems, Bavaria, and Hanover. The future for Emsland and the Upper Rhine Valley is less optimistic.

Natural gas gains . . . West Germany's small natural-gas industry is now six times larger than it was 3 years ago.

Output in 1956 averaged 35,500 M.c.f. daily, a gain of 53 per cent over 1955. Nearly half this output came from Rehden field near Diepholz. Output from the field could be further increased at least 6,300 M.c.f. daily.

The country's second ranking gas producer was the Bentheim field. It averaged nearly 5,500 M.c.f. daily, a gain of 68 per cent over 1955. Discovery of a new gas zone saw production in the field increase rather than decrease for the first time since 1948.

At least three fields—Itterbeck-Halle, Adorf, and Frenswegen—have considerable shut-in production. This is partly due to a lack of pipeline capacity, and also to special limiting agreements.

A Socony Mobil Oil Co., Inc., subsidiary will begin deliveries this year from Isen field, near Muehldorf, to Munich. The company, Bayerische Mineral-Industrie A.G., will deliver 1,750 M.c.f. daily starting in June.

Pakistan Eyes Gas Line

Outlet would connect Sylhet with largest city in East Pakistan; report says field can supply entire country

PAKISTAN'S brief natural-gas history is getting to be a better rags-to-riches story with each passing month.

The latest word from the country is that Sylhet field will be able to supply East Pakistan's natural-gas demand for decades. This means that both East and West Pakistan now have large enough reserves to meet domestic needs. The two sections of the country are 1,000 miles apart.

Five years ago the undeveloped, young nation—it's not quite 10 years old—didn't have a gas well.

The capabilities of Sylhet field was indicated in a report recently submitted to the East Pakistan Government by Sui Gas Transmission Co. at the request of the country's planning board and Pakistan Petroleum, Ltd.

Pipeline talked . . . The report discussed possibilities of a 145-mile pipeline from Sylhet to Dacca, a city of 400,000, the largest in East Pakistan. It was prepared by two of Sui Gas' chief engineers.

If the government approves the project by June and pipe is available in time, construction could start by December 1958. Because of the country's climate, work would have to be started about December 1 and be completed by mid-May when the rainy season starts.

Cost of the line would be about $9,000,000, assuming that a highway and two railroad bridges would be available for river crossings. Otherwise, the project would be uneconomic.

The government would have an interest in the project through its 30 per cent ownership of Pakistan Petroleum. Burmah Oil Co., Ltd., holds the remaining 70 per cent of P.P.L.

While Sylhet may not be as big as Sui gas field in West Pakistan, it still is a prolific field. Here is what Sui's report disclosed:

. . . A high-pressure, 8-in. line could supply Dacca with up to 24,000 M.c.f. daily without compressors. Inlet pressure would be 1,200 psi.

. . . The gas might be pure enough to send through the line without treating. This is not yet certain. The gas is purer than gas from Sui field. Otherwise the two supplies have the same general characteristics.

. . . Proved reserves are estimated at 70 billion cubic feet. Probable reserves are placed at 300 billion cubic feet. So far, two wells have been drilled.

Sui line reaches Indus . . . In West Pakistan, a 50-mile section of the 217-mile, 16-in. Sui-Multan gas line is completed. But the toughest part of the project, pulling the line across the Indus River, was postponed for a year when the Suez Canal closing delayed arrival of equipment. In the rainy season, the river floods an area up to 7 miles wide and currents reach more than 10 m.p.h.

Reserves of P.P.L.'s 30-sq.-mile Sui field are now placed at 4 trillion cubic feet. Three of the field's six wells are on production, producing 32,000 M.c.f. daily for consumption in Karachi.

Philippine Tests Set

Stanvac and PODCO will explore in northern Luzon

TWO companies are sending equipment into northern Luzon for wildcat tests on adjoining concession blocks.

Standard-Vacuum Oil Co. expects to spud by March 1. The test will be about 50 miles north and slightly west of a wildcat drilled by Philippine Oil Development Co. (PODCO) last year.

The Stanvac site is just south of the junction of Cagayan and Chica Rivers, near the village of Faire near an outcrop visible from the air.

The rig for the test arrived in Manila January 15. But torrential rains caused washouts on the main road to the remote Cagayan Valley, and several detours were needed.

Meanwhile, PODCO plans to spud its 2 Tumauini within a few weeks. Pipe for this test was shipped from New Orleans around Christmas. The new test will be west of 1 Tumauini, abandoned last year at 10,414 ft.

Noncommercial shows of gas and oil were found, but the well was believed to be about 1,500 ft. east of the crest of the structure.

Caltex also has concession acreage in Cagayan Valley. Its exploration subsidiary, American Overseas Petroleum, Ltd., is conducting preliminary work in the area.

Along with the Cagayan acreage, the Philippine Government also has granted blocks to three companies in west-central Luzon. The firms are Philex Mining Corp., a local firm; PODCO; and San Jose Oil Co., Inc. Majority interest of the latter is held by Pantepec Oil Co. and Pancoastal Petroleum Co.

World briefs

The 84,730-ton Universe Leader, currently the world's biggest oil tanker, is due soon in Cape Town, South Africa, for its first visit to a dry dock since its launching last fall. It will be dry docked, scraped, and painted at the Sturrock dry dock after a trip from Brazil. Since it's 7 ft. wider than the Queen Elizabeth, it will have a bare 10-ft. clearance on either side.

Hunt International Oil Co. is drilling ahead at 12,751 ft. in its second wildcat in West Pakistan. The 2 Dhak is located in the coastal region between Karachi and the Iranian border, on one of two 10,000-sq. mile concession blocks the company holds in the country. The 1 Dhak was abandoned at 8,404 ft. as a dry hole.

Standard-Vacuum Oil Co. has made a natural-gas discovery in its second wildcat in West Pakistan. Gas flowed in moderate volume from 2,300 ft. in the 1 Mari, located near Sukkar, 300 miles north of Karachi. A second, slight show was encountered at 3,400 ft. The well is drilling ahead. Projected depth is 12,000 ft.

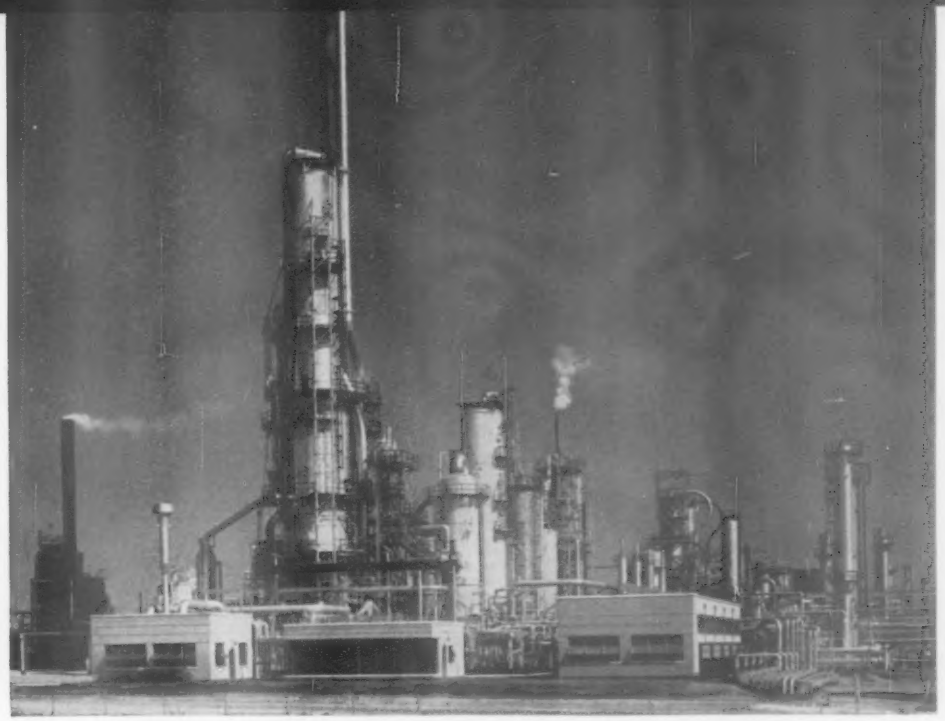
Stanvac's first test, 1 Digh, was located 130 miles east of Karachi. It was abandoned at 10,908 ft. late last year as a dry hole.

International Petroleum Co., Ltd., this month started marketing automotive oils and greases in Ecuador. The company has been supplying aviation fuels to Guayaquil and Quito international airports and recently signed a long-term contract with the Ecuadorian Government to continue the service. International and its subsidiaries are the largest marketers of petroleum products in Colombia and Peru.

Imperial Chemical Industries will double its investment in petrochemicals at Wilton, Yorkshire, England. The company is adding a second ethyleneglycol plant to bring production to 11,000 tons a year by early 1959. The plant will operate on ethylene from adjacent cracking plants, which use Middle East naphthas as feed stock.

The firm is also expanding production of terylene polyester fiber from 3 to 30 million pounds a year.

Petrochemical output is growing fast in the United Kingdom. British Hydrocarbon Chemicals, Ltd., will build an 11,000-ton yearly polyethylene plant at Grangemouth, Scotland. It will use the low-pressure process of Phillips Petroleum Co. Joint owners of the company are British Petroleum Co., Ltd., and The Distillers Co., Ltd.



CAPACITY of the cat cracker at Cosden's Big Spring, Tex., refinery has been expanded to handle 13,300 bbl. per day at 61 per cent conversion, 2½ times its original capacity.

Custom Refining Is Cosden's Specialty

. . . Plant has the equipment . . . and the flexibility

West Texas processor uses selective fractionation to a high degree to obtain pentane-free stocks. Highly modernized plant includes Rexforming, Unifining, alkylation, polymerization, Platforming, Udex, and cracking units to obtain top-quality products. Maximum utilization of natural gasoline as blending material is realized. Next likely step might be isomerization.

by Larry Resen
District Editor

AT Cosden Petroleum Corp.'s Big Spring, Tex., refinery, selective fractionation is practiced on a large scale. By removal of pentanes from such streams as catalytic naphthas, Platformer feed, and alkylate, Cosden is coming up with high-octane-motor-fuel stocks which are pentane-free.

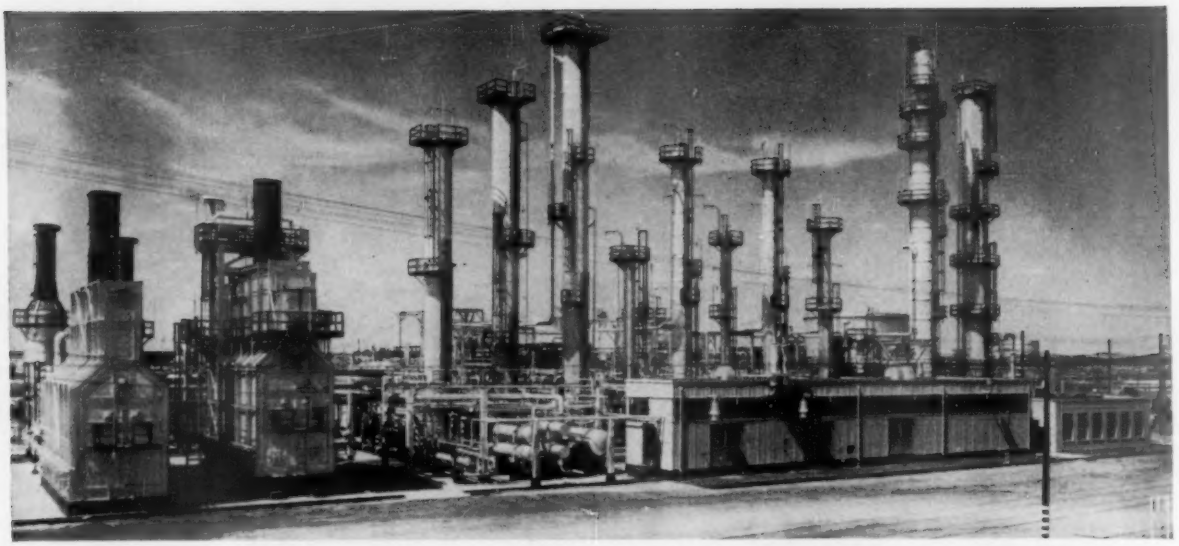
Net result of this processing scheme is to permit the inclusion of a high percentage of natural gasoline as a refinery raw material and maintain complete control of volatility for selective blending to the exacting specifications of many customers. Pentane, meanwhile, is immediately available as a feed stock for an isomerization unit should octane requirements make this additional step necessary.

Currently, the processing setup at Cosden is one which would please any refiner trying to make his octanes stretch to meet an ever-rising demand curve. In addition to the latest installation, a 4,000-bbl. Rexformer *(The Oil and Gas Journal, November 19, 1956, p. 238)*, the plant includes a 4,500-bbl. Platformer, a 2,600-bbl. Udex unit now in aromatics production, a 2,100-bbl. Unifiner, a 3,200-bbl. alkylation unit, a reactivated polymerization unit, a fluid catalytic cracker, and a thermal unit, together with associated feed-preparation units. All of these installments go to process the output of two crude units with a combined capacity of 28,500 bbl. Perhaps more than anything else, Cosden serves to illustrate the lengths to which the refiner of today has to go to maintain a leading competitive position. As a custom refiner it produces specification products to meet customer requirements. Probably most significantly, customers with their own refineries are able to obtain the quality products at a net economic advantage. To meet customer demands, Cosden provides completely segregated blending, storage, and loading facilities and is today manufacturing 14 different grades of automotive gasoline.

Processing setup . . . The story of this West Texas refinery has been one of gradual unit bottleneck removal and expansion coupled with a shifting processing scheme to fully utilize newly acquired units. In tracing through the general processing setup, some of these shifts and expansions will be touched upon.

Crude charge to the plant is received in two units: the No. 1 unit with a 19,400-bbl. capacity and the No. 2 unit with a 9,100-bbl. Conventional crude

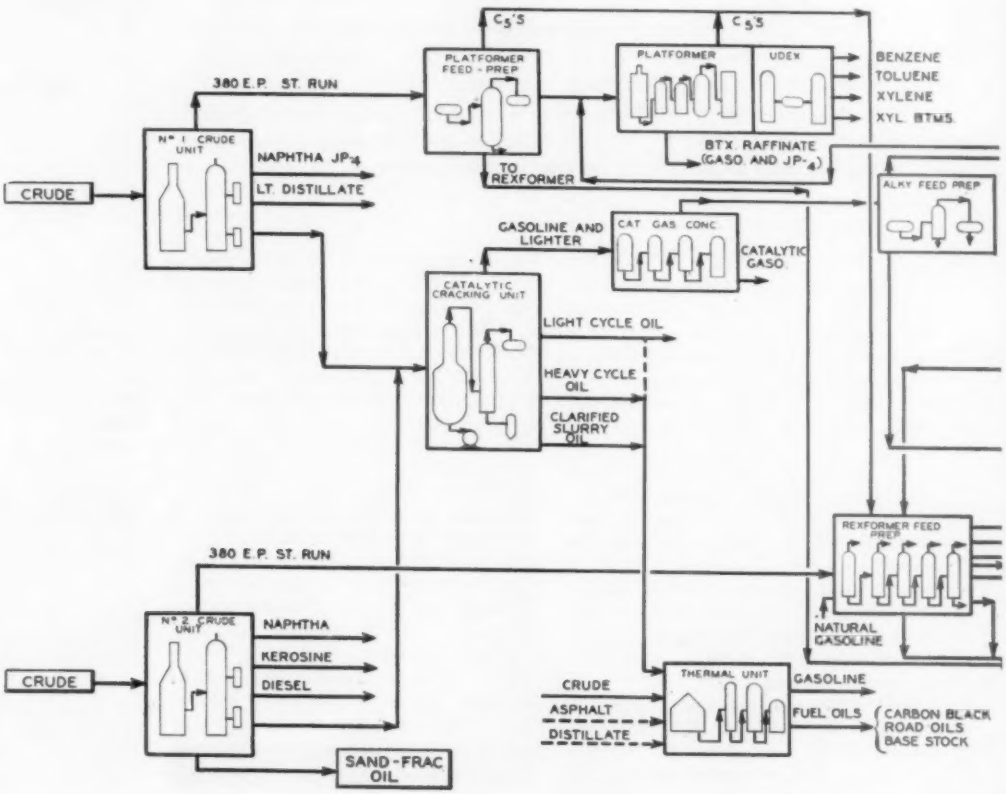
REFINING



PLATFORMING UNIT used exclusively for aromatics production. This has made for improved operating efficiency.

distillation is used to prepare a 380°-e.p. straightrun stock for the Platformer and Rexformer. Catalytic gas-oil is obtained off both units plus intermediate products, such as jet fuel, diesel, kerosine, and light distillates. Main revamp on the units included the addition of a vacuum tower and heater on the No. 2 unit to provide more virgin gas-oil charge to the cat unit. Asphalt product off the No. 1 unit is a little under 20 per cent of the crude charge, and output and handling is geared strictly to the sales department. Asphalt bottoms not sold as such are later visbroken.

The Dubbs thermal unit, meanwhile, is used strictly as a work horse at the plant to handle heavy cat cycle oils, heavy crude unit products, asphalt, etc. The unit is also geared to match sales demand and will operate to produce No. 6 oil, which is cut back to No. 5 oil with an economic advantage. The previous notation of pentane-free stocks, incidentally, does not apply to the thermal output of 86-octane leaded motor fuel. This is the only stream wherein pentanes are permitted to remain at the present time. Interestingly, at the

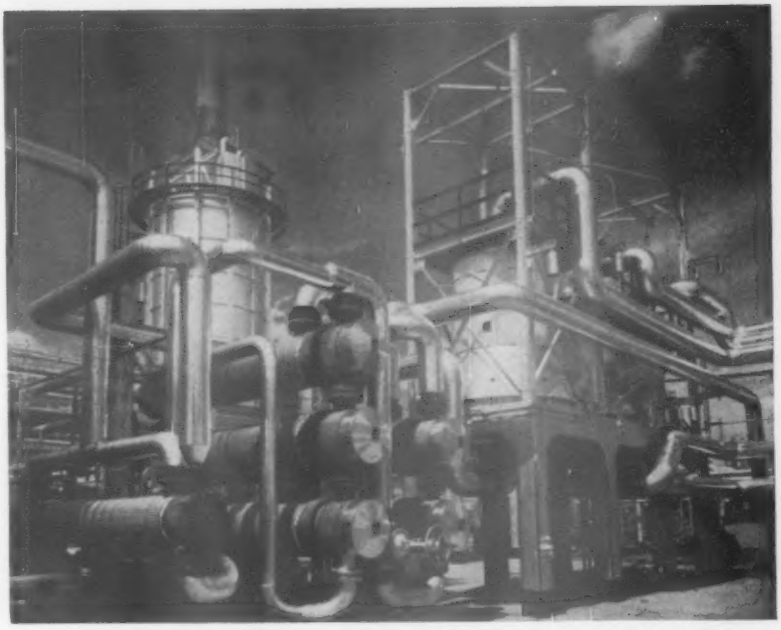


THE STORY of this West Texas refinery has been one of gradual unit bottleneck removal and expansion coupled with a shifting processing scheme to fully utilize newly acquired units. Here is a summary of the processing today.

time of its original installation, this unit produced the highest-octane thermal gasoline in the country. It now provides the refinery with its lowest-octane stock.

Cat cracker . . . The U.O.P. fluid cat cracker has been expanded to handle 13,300 bbl. per day at 61 per cent conversion. This is up over 2½ times its original 5,000-bbl. design and up considerably over its previous revamp when it was modified to operate at an average at 9,000 bbl. per day at 61 per cent conversion. Maximum possible space velocity is now being used on the regenerator. Where it originally operated at 0.9 ft. per second the unit is now at about 2.6 ft. per second. In two successive revamps, the blower's capacity was increased. In the first instance, a larger blower rotor was installed after machining out the case to accommodate it. In the second case a new blower was built around the original rotor.

A big portion of the latest revamp involved the complete redesign and rebuilding of the gas-concentration unit. This installation was a limiting factor on cat cracker operation. Its revamp affected several operating features of the plant. The present setup makes it possible to have a central source of olefin feed since the absorber gas and C_3 and C_4 liquids from the thermal unit are processed at the gas-concentration unit along with catalytic cracking streams. Catalytic gasoline is depentanized in the unit to provide 4,500 bbl. of 3.5-R.v.p. motor fuel with a 92 clear octane rating and a 96.5 leaded rating.

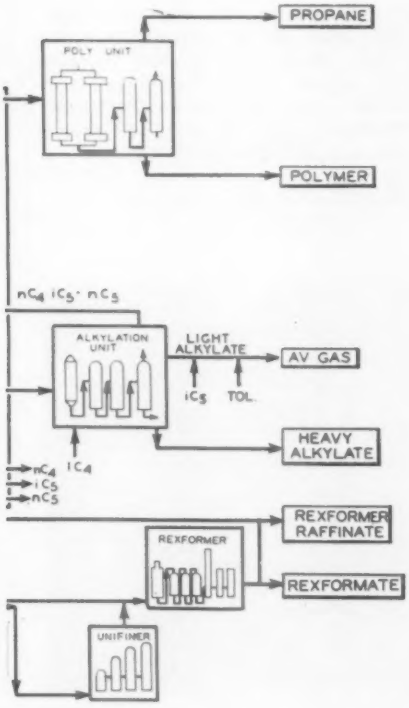


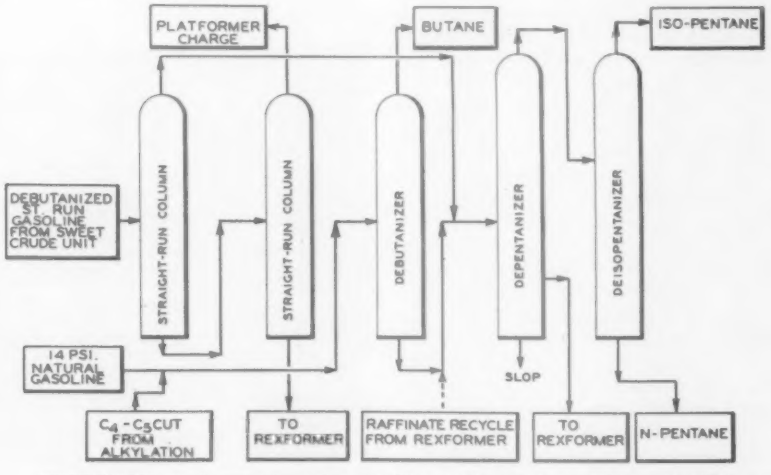
REXFORMER unit furnace is seen in background, with reactors at right.

Alkylation . . . The new process setup made a greater amount of amylenes available for alkylation. Additionally, the C_3's and C_4's increased in volume and this made it desirable to review the alkylation-polymerization setup.

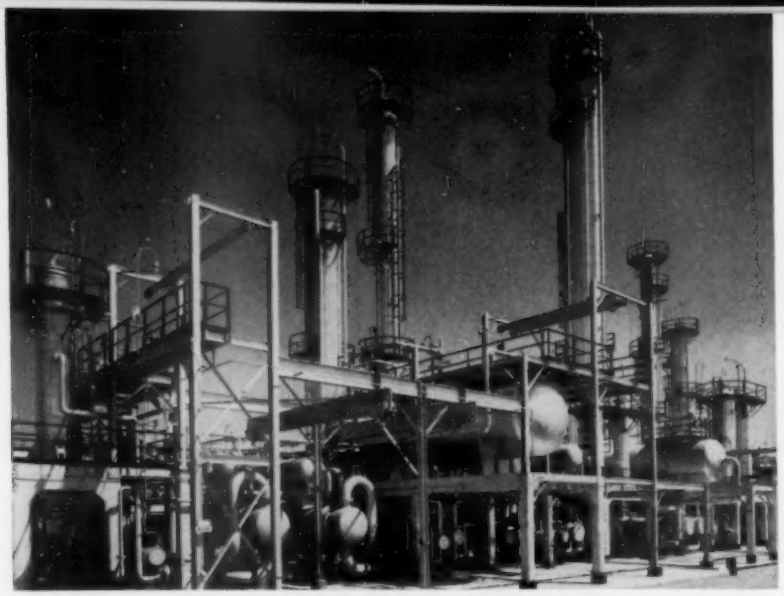
Olefin feed to the alky unit had been subjected to a feed-preparation pass through the former poly plant. Propylenes as well as butylenes were being used as olefin feed for the alky unit. With the depentanization of catalytic gasoline, amylene also became available as alky feed stock. At the alkylation unit, meanwhile, the primary limitation was on the front end, both in the contactors and prefractionating tower.

The heat load on the contactors was studied with four different approaches: (1) Operate only on propylenes and butylenes; (2) operate on propylenes, butylenes, and amylenes; (3) operate only on butylenes and amylenes except for a small amount of C_3's required in the HF stripper; or (4) operate on propylenes and butylenes plus part of the amylenes. The results indicated the best route to take was No. 3, charging all of the butylenes and amylenes and to reactivate





REXFORMER feed-preparation diagram. The Rexformer is used for motor-fuel.



NEW PROCESS SETUP has made a greater amount of amylenes available for alkylation. Here is a view of the alkylation unit.

the poly plant to utilize propylenes. Amylene alkylation is economic in Big Spring where a ready supply of reasonably priced isobutane is available. Natural gasoline is also available at reasonable cost for volatility blending per se or for fractionation of the pentanes-and-lighter for selective blending and subsequent reforming of the heavy fraction. No lowering of light-alkylate quality was observed when propylene was replaced with amylenes. In addition, there was no decrease in cat naphtha octane as a result of depentanization. Fortunately, all of the fractionating equipment in the alky unit, with the exception of the debutanizer, was sized to handle the new charge and charge rates. The debutanizer was remodeled to serve as the depentanizer.

The alky feed-prep unit, meanwhile, was set to handle all of the olefin feed for both the poly plant and the alky plant, and hence received the entire olefin output from the cat cracker. In order to recover as many amylenes as possible it meant more n-pentane also had to be brought in with the olefin feed. Hence, a depentanizer figured in the picture again. All of the normal and isopentane and normal butane is recovered from the alkylate and charged to the Rexformer feed preparing unit. The alkylate product stream is pentane-free. Feed to the alky unit includes an average 29.2 mole per cent of butylenes and 25 mole per cent amylenes. As a result of the changes, alky-unit capacity has been increased from about 2,100 to 3,200 bbl. per day. Yield of light alkylate amounts to 96.3 per cent of total alkylate yield. It has an R.v.p. of 2½ psi. and a leaded F-4 performance number of 142.5. Additionally 480 bbl. of polymer gasoline is being realized with a 2-3 R.v.p. and a 94 F-1 number clear, and 99-plus leaded.

Aromatics . . . Under previous operations—pre-Rexformer—the Platforming unit was operated on a blocked-out setup to produce motor fuel one-third of the time and aromatics two-thirds of the time. Now the 380°-e.p. straight-run naphtha from the No. 1 crude unit is charged to a Platformer feed-prep unit. Removal of C_5's takes place here and the charge is split up with a 150°-300° cut being pulled off for Platformer feed and a 300°-380° cut charged to a Unifiner and then into the Rexformer feed system. The pentanes are also pulled out of the Platformer, and combine with the C_5's from the feed-prep unit and are charged to the Rexformer feed-prep unit, which serves to act as a central depentanizer for numerous plant streams.

Availability of the Rexformer made it possible to operate the Platformer strictly for aromatics production, and this has resulted in improved operating efficiency. The Udex unit had previously been operating at about 2,000 bbl. and recovering 45 per cent aromatics. Now it's running about 2,600 bbl. and recovering about 52 per cent for a multiple gain. Part of this efficiency was gained by cutting the charge rate to the Platformer; it operates simply to keep the Udex unit full. Hence, it has been possible to decrease the velocity of the stream through the unit and thereby increase conversion. Some Udex bottlenecks were also eliminated in the project.

Changes to the unit included additional cooling and condensing equipment on the existing system and an additional preheater to the benzene column. The xylene column had a preheater and larger reboiler installed. The water-wash systems of the raffinate and extract streams were revamped and larger solvent stripper reboiler was added.

Platformer-Udex operation is flexible and can produce nitration-grade benzene and toluene, and 10° xylene simultaneously. However, Cosden is installing a styrene plant at the refinery which will require the mixed xylenes stream as a feed stock. The styrene economies dictate the unit's being operated for maximum xylene production by supplementing the 150°-300° cut with a xylene cut from the Rexformer feed-prep unit.

Fractionation . . . The Rexformer feed-preparation unit is a key factor in the plant's operating to produce pentane-free, high-octane stock. As has been noted, C_5 streams from the Platformer, Platformer feed-prep unit, and alkylation unit are charged to this facility. In addition it receives the 380°-e.p. straightrun produce from the No. 2 crude unit plus purchased natural gas-

REFORMING ROW. In right foreground is seen the Rexformer, in background is Platformer.

Table–1 Over-All Plant Balance

(Figures in barrels per day)

Crude Unit No. 1	
Charge	19,400
Yields:	
Straightrun	3,730
Naphtha	500
Light distillate	1,940
Gas-oil	9,000
Asphalt	3,600
Crude Unit No. 2	
Charge	9,100
Yields:	
Straightrun	2,650
Naphtha	800
Kerosine	900
Diesel oil	650
Gas-oil	2,770
Sand-frac oil	1,050
Thermal Cracking Unit*	
Charge:	
Cycle oils	3,000
Miscellaneous	4,000
Yields:	
C_3-C_4's	500
Gasoline	3,600
Carbon blk. oil	1,500
Base-stock oil	800
Catalytic Cracking Unit	
Charge	12,000
Yields:	
Alky. and poly feed	4,000
Catalytic gasoline	4,500
Light cycle oil	2,800
Heavy cycle oil Plus slurry oil.	1,200
Alkylation Feed-Prep Unit	
Charge:	
Cat olefins	4,000
Therm olefins	500
Yields:	
Poly feed stock	1,100
Alky feed stock	3,400
Alkylation Unit	
Charge:	
Olefins	3,400
i-C_4	1,300
Yields:	
C_3	230
C_4's and C_5's	1,000
Light alkylate	2,600
Heavy alkylate	100
Polymerization Unit	
Charge	1,100
Yields:	
C_3	360
Polymer	480
Platformer Feed-Prep Unit	
Charge	3,730
Yields:	
Platformer feed	2,230
Rexformer feed	1,300
C_5's to Rex. feed prep	200
Platformer	
Charge:	
Feed prep	2,230
From Rex. feed prep	700
	2,930
Yields:	
Udex charge	2,600
C_5's to Rex. feed prep	200
Udex Unit	
Charge	2,600
Yields:	
Raffinate	1,200
Benzene	150
Toluene	450
Xylene	700
Heavy aromatics	100
Rexformer Feed-Prep Unit	
Charge:	
Straightrun No. 2	2,650
C_5's from Plat. F.P.	400
Natural gasoline	3,100
C_4's-C_5's from alky.	1,000
	7,150
Yields:	
n-Butane	600
Isopentane	1,400
n-Pentane	1,600
BTX chg.	700
Rex. chg.	2,850
Rexforming Unit	
Charge:	
From feed prep	2,850
From Plat. F.P.	1,300
Recycle raffinate	1,900
	6,050
Yields:	
Rexformate	3,060
Raffinate	2,250
Pentanes	200

*Typical blocked-out operation.

oline. Finally, Rexformer raffinate is also recycled here under certain conditions to be depentanized. The feed-prep unit consists of two straightrun columns, a debutanizer, depentanizer, and deisopentanizer. Charge to the No. 1 straightrun column consists of debutanized straightrun gasoline from the No. 2 crude unit. This is split in the column, with bottoms being charged to the second straightrun column and overhead entering the depentanizer. An overhead stream from the second column, high in xylene-forming components, is added to the Platformer feed stock. Bottoms from this column serve to feed the Rexformer.

Charge to the debutanizer consists of 14-lb. natural gasoline, C_5 streams from the Platformer, Platformer feed-prep, and alkylation units. Overhead product here is withdrawn as N.G.A.A.-specification butane while the bottoms pass into the depentanizer. Overhead from the depentanizer is split in the deisopentanizer to provide N.G.A.A.-specification isopentane and normal pentane. Depentanizer bottoms are added to the Rexformer feed stream.

The Rexformer feed-prep unit receives 7,150 bbl. of charge streams, plus Rexformer raffinate if recycled, of which 3,100 bbl. is natural gasoline. Products include 1,400 bbl. of isopentane, 1,600 bbl. on n-pentane, 700-bbl. Platformer charge, and 2,850-bbl. Rexformer charge. This latter unit operates to produce 2,960 bbl. of 2.8-R.v.p. Rexformate with an unleaded F-1 number of 98 and a leaded number of 104.

With the present setup, Cosden finds itself in a position to tailor its output to meet any desired specification. The pentane-free gasoline pool is especially desirable with the more complex volatility and vapor-pressure specifications on gasolines. The Rexformer can operate to vary the quality of the Rexformate by altering either reforming severity or extraction efficiency. It is also optional whether it operates so that the recycle stream goes to extinction or is removed for jet fuel.

The Platformer-Udex combination can prepare the BTX product in varying quantities to meet a fluctuating demand. The use of the deisopentanizer provides an isopentane source for avgas blending and eliminates the need for outside purchases of this material. Finally, the n-pentane, which is recovered as a pure stream and is blended back with motor fuel on a selective basis, stands as the ideal feed stock for an isomerization unit should one be required down the line.

TABLE 2—GASOLINE-PRODUCT OCTANE RATINGS

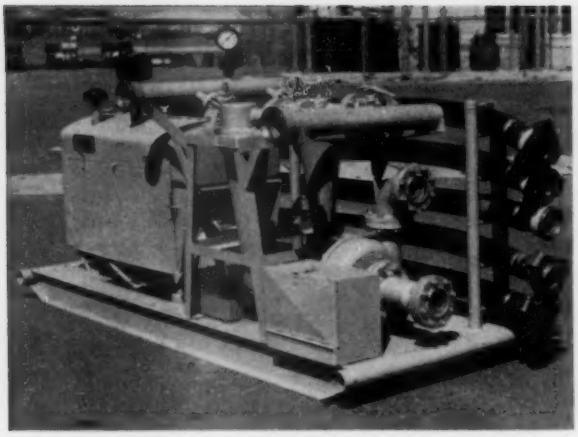
Thermal unit—F-1 75 clear; 86 plus 3 cc. TEL; R.v.p. 4.5.
Cat. gasoline—F-1 92 clear; 96.5 plus 3 cc. TEL; R.v.p. 3.5.
Polymer gasoline—F-1 94 clear; 99 plus 3 cc. TEL; R.v.p. 2.3.
Lt. alkylate—F-4 p.i.v.; 142.5 perf. No. plus 4.6 cc. TEL; R.v.p. 2.5.
Rexformate—F-1 98 clear; 104 plus 3 cc. TEL; R.v.p. 2.8.

TABLE 3—FEED-STOCK ANALYSIS: ALKY AND POLY UNITS

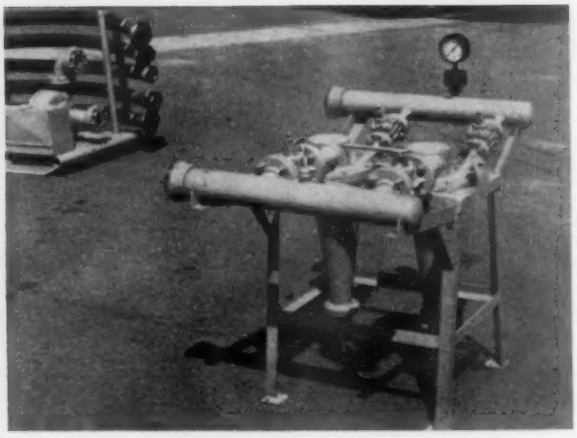
Component:	Mole per cent
Alkylation Unit	
C_3	2.5
C_4=	29.2
i-C_4	20.5
n-C_4	8.5
C_5=	25.1
i-C_5	14.2
Polymerization Unit	
C_2	0.1
C_3=	62.9
C_3	29.9
C_4=	0.1
i-C_4	2.7
H_2S	4.3

Acknowledgments

Cooperation of the management of Cosden Petroleum Corp. in the release of this material and data is gratefully acknowledged, as is the helpful assistance rendered by Allen Orr, chief technologist, and Carol Belton, manufacturing coordinator.



DUAL 8-in. cyclone unit bolted to the engine and pump skid. Fig. 1.



DUAL 8-in. cyclone unit removed from engine and pump skid. Fig. 2.

Cyclones Score 77 to 100 Per Cent

. . . in removing sand and cuttings from drilling fluid . . . and 82 to 98 in reclaiming lost-circulation materials

by J. L. Lummus and P. P. Scott, Jr.

AN 8-in.-diameter cyclone is capable of removing 77 to 100 per cent of the sand and cuttings coarser than 325 mesh and reclaiming 82 to 98 per cent of the lost-circulation materials from drilling fluids having a density range of 8.5 to 10.5 lb. per gal. Removal of sand and cuttings from drilling muds with cyclones has increased penetration rates and has reduced lost circulation, water consumption, mud costs, and wear on bits and pumps. Mud costs on one Texas Panhandle well were reduced approximately 45 per cent.

The need for mud treatment . . . In many areas accumulation of rock cuttings and sand in the drilling mud is a problem to both operator and drilling contractor. The operator is burdened with expenditures for maintaining desired physical and chemical properties of drilling mud which are usually adversely affected by the accumulation and dispersion of rock cuttings and cavings. The drilling contractor is faced with accelerated wear on the drill string and excessive maintenance and repair costs on pumps when the sand content of drilling mud is high. Both parties suffer from the reduced penetration rate caused by accumulation of fine solids.

The vibrating screen or shale shaker is helpful in removing coarse solids from drilling mud but fine solids remain suspended in all except the very low-viscosity drilling muds. When the shale shaker is bypassed so that lost-circulation materials can be carried in the drilling mud, the effects of solids accumulation assume even greater significance. Hydraulic cyclones effectively remove cuttings and sand from drilling muds even under these conditions.

Part 1 of this paper presented results of tests with 3-in. hydraulic cyclone to remove clay solids from drilling muds while reclaiming barite and lost-circulation materials. For removing cuttings and sand from drilling muds while reclaiming lost-circulation materials 8-in. diameter cyclones are more applicable.

Authors are with Research Laboratories, Pan American Petroleum Corp., Tulsa.

Testing Apparatus

Laboratory . . . Laboratory testing apparatus consisted of an 8-in.-diameter cyclone fed by a single-stage, open-impeller, centrifugal pump powered by an electric motor. The test apparatus was shown in Fig. 2 of Part 1.

Field . . . Single and dual 8-in.-diameter cyclones fed by single-stage, semiopen and open-impeller centrifugal pumps were used for field tests. The pumps were driven by 30-40-hp. gas-gasoline engines. Fig. 1 shows a dual 8-in. cyclone unit bolted to the skid supporting the pump and engine. This arrangement was used when transporting the assembly from one location to another. The cyclone unit removed from the engine and pump skid is shown in Fig. 2.

Cyclone Tests

Low-density laboratory and field muds containing shale cuttings and sand were used for laboratory tests. Cellophane flakes, mica, and ground walnut shells were added to the mud during some tests to determine the efficiency of a cyclone to reclaim lost-circulation materials. Laboratory muds were prepared with bentonite and low-yield clay. Field mud was obtained from a well in Eola field, Oklahoma.

While muds were pumped through the cyclone, input pressure, back pressure, diameter of the underflow orifice, and mud viscosity were varied. Samples of input and overflow mud streams of the cyclone were obtained under various test conditions. The samples were screened on U. S. Standard Sieve

Here's what the tests showed . . .

Part 1 of this article, published October 8, 1956, showed the effectiveness of 3-in. cyclones in recovering barite from weighted muds. For removing sand and cuttings, especially from unweighted muds, the 8-in. cyclone is applicable. Here is what tests show:

1. An 8-in. cyclone removes from drilling mud 77 to 100 per cent of the sand and cuttings in the particle size range of 20 to 325 mesh.

2. The lower the mud viscosity, the more effectively a cyclone removes sand and cuttings.

3. An 8-in. cyclone will remove all of the sand and cuttings coarser than 325 mesh from drilling mud having a Stormer viscosity of 45 cp. or lower.

4. Optimum underflow orifice on an 8-in. cyclone is approximately 5/16-in. in diameter.

5. From 2 to 15 bbl. of mud are lost from the cyclone underflow through a 5/16-in. diameter orifice when removing sand and cuttings from 1,000 bbl. of mud.

6. Daily operation of two 8-in. cyclones for 2 to 4 hours keeps a mud system relatively free of sand and cuttings under average drilling conditions.

7. When removing sand and cuttings from weighted drilling muds with an 8-in. cyclone, the loss of barite varies from 5 to 15 per cent.

8. From 2 to 18 per cent of the lost-circulation materials in drilling mud having a density of 8.5 to 10.5 lb. per gal. are lost in the underflow when the mud is passed through an 8-in. cyclone.

9. The lower the mud weight, the greater is the loss of lost-circulation materials to the underflow of a cyclone.

10. Removal of sand and cuttings from drilling mud with cyclones increases bit life, increases penetration rate, decreases lost circulation, reduces consumption, and reduces pump repair costs.

Series Screens Nos. 30, 60, 100, 200, and 325. Comparison of screen analyses of sand and cuttings from the overflow and input mud indicated the separating efficiency of the cyclone. Underflow and overflow rates were measured with gage tanks.

Field tests . . . The first field test of the cyclones was conducted on a well in Lipscomb County, Texas. The cyclone was used to remove sand and cuttings from the mud and to retain lost-circulation materials. Steel mud pits were used in the rig circulating system. A single 8-in. cyclone fed by a centrifugal pump was used for reconditioning the mud. The position of the cyclone and pump with respect to the mud pits is shown in Fig. 3.

The suction line of the centrifugal pump was connected to the line between the first and second pits downstream from the return line from the well. The cyclone was suspended over an earthen waste pit where the underflow was discharged. The overflow of the cyclone, which consisted of the clean mud, was discharged into the second pit downstream from the return line from the well. No shale shaker was employed in the circulating system since cottonseed hulls were carried in the mud.

A second test was conducted on a well in Ochiltree County, Texas. Dirt pits were used in the rig circulating system. A shale shaker was kept in the circulating system when lost circulation materials were not being used. A single 8-in. cyclone fed by a centrifugal pump was used to treat the mud. For a short period of time the rig standby pump was used to feed the cyclone.

Other tests are now in progress in North Louisiana; San Juan County, New Mexico; West Texas; and the Texas Panhandle.

Test Results

Laboratory tests . . . The performance of an 8-in. cyclone for removing from unweighted drilling mud sand and cuttings in the particle size range of 20 mesh to 325 mesh is shown in Table 1. An underflow orifice diameter of 5/16-in. provided maximum rejection of cuttings with the smallest loss of mud and without plugging. An orifice ¼ in. in diameter plugged occasionally while an orifice ½ in. in diameter passed too much mud The density of the underflow mud containing sand and cuttings varied from 12 to 16 lb. per gal.

Sand and cuttings were removed from weighted drilling muds but with a loss of 5 to 15 per cent of the barite present in the mud passed through the cyclones.

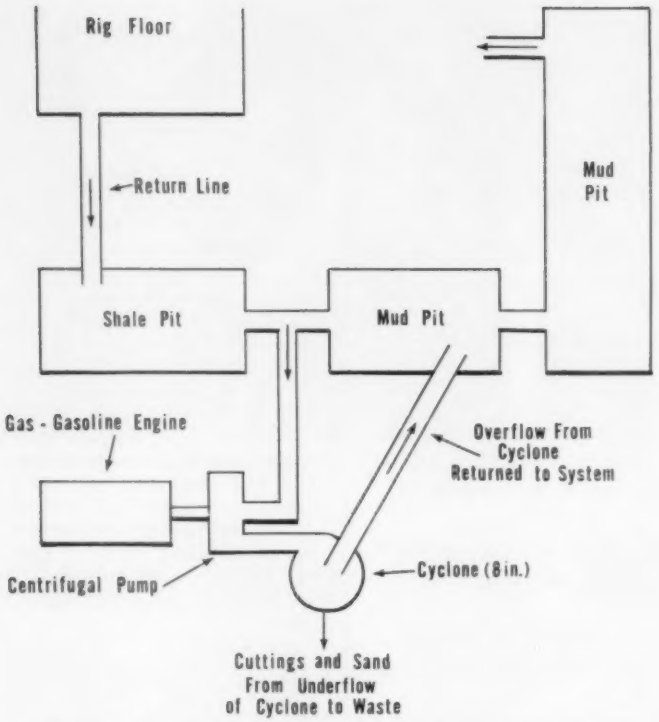
Fig. 4 shows the effect of input pressure to an 8-in. cyclone on efficiency of removal of sand and cuttings from a drilling mud. Fig. 5 shows the percentage of cellophane flakes, mica, and walnut shells rejected while removing sand and cuttings from the drilling muds with a cyclone.

Lipscomb County, Texas . . . The first 8 hours of operation of the cyclone unit on the well in Lipscomb County, Texas, reduced mud weight from 9.7 to 9.4 lb. per gal. by removing sand and cuttings. The sand content of 3 per cent was lowered to 0.5 per cent. Approximately 5 per cent of the cottonseed hulls in the mud passed through the cyclone was lost in the underflow.

After the mud weight was reduced to 9.2 lb. per gal., only intermittent operation of the cyclone was required to maintain this weight. Approximately 50 per cent less water was used to maintain the mud after cyclone treatment was started. A comparison of drilling operations on a nearby well where a cyclone was not used appears in Table 2.

Ochiltree County, Texas . . . For the second test a cyclone unit was placed on a well in Ochiltree County, Texas, while drilling at a depth of 3,300 ft. Between the depths of 3,300 ft. and 3,640 ft., approximately 25,000 lb. of sand and cuttings was removed from the drilling mud. When cyclone treatment began the mud weighed 10.8 lb. per gal. After 7 hours of treatment the mud weight was 10.2 lb. per gal.

At a feed rate of 206 g.p.m. the overflow and underflow volumes were 200 and 6 g.p.m., respectively. The underflow, which weighed 15.7 lb. per



POSITION of cyclone unit and pump in well in Lipscomb County, Texas.

gal., contained 75 per cent solids. The overflow weight varied from 9.4 to 9.6 lb. per gal.

While surface casing was being cemented, tests were made using the rig standby pump to feed the cyclone. Use of the standby pump caused fluctuation in flow, but solids were removed satisfactorily. The input rate to the cyclones was controlled by bypassing a portion of the output mud of the standby pump to the mud-gun lines.

After surface casing was set at approximately 3,700 ft., new mud was prepared and lost-circulation material added before drilling out the plug. Lost circulation had been experienced below 3,700 ft. in other wells in this area. The cyclone was used to keep the mud weight below 9 lb. per gal. while drilling to a depth of 7,120 ft. At 4,000 ft. the lost-circulation material was removed since the mud weight could be maintained low. No lost circulation was experienced. At 7,120 ft. the mud costs totaled $3,600 as compared to $6,400 at the same depth for the offset well where a cyclone was not used. This well has just been completed. Tabulated results concerning pump repairs, bit life, etc., are not yet available.

TABLE 2
Comparison of Operations With and Without a Cyclone on Wells in the Panhandle Area, Texas

	Well A*	Well B†
Pits jetted (number of times)	16	13
Mud costs (dollars per foot drilled):		
Excluding lost-circulation materials	3.31	1.80
Including lost-circulation materials	4.17	2.10
Bits (number)	16	12
Pump repairs (number)	5	2
Drilling rate (feet per hour)	11	14

*Without cyclone. †With cyclone.

San Juan County, New Mexico . . . Initial operation of a dual-mounted cyclone unit at a well in San Juan County, New Mexico, lowered the mud weight of the entire system from 10.2 to 9.6 lb. per gal. Lost circulation was encountered in the Mesaverde at a depth of 3,160 ft. just prior to installation of the cyclone unit. With reduced mud weight, no further loss was experienced. The cyclones are still in operation at this well.

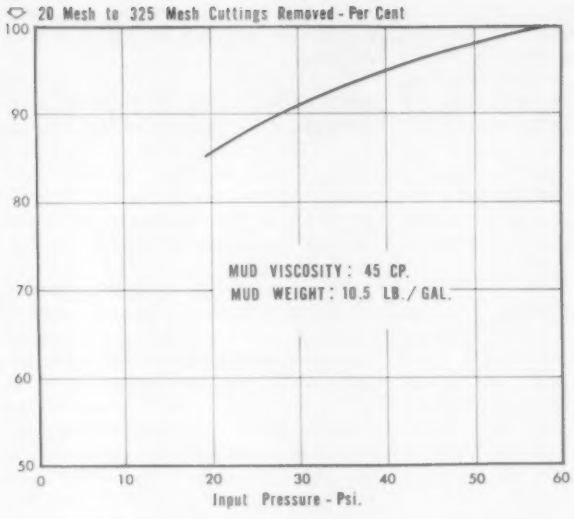
Other field tests with cyclones now in progress are resulting in a reduced incidence of lost circulation. Pump repairs have been reduced more than 50 per cent in areas when sand has been removed from the mud with cyclone treatment.

Explanation of Results

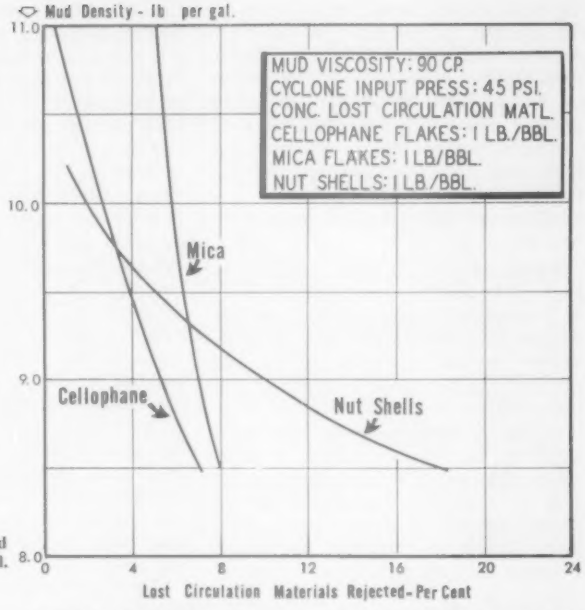
The 8-in. cyclone was found capable of removing from drilling mud 77 to 100 per cent of the sand and cuttings in the particle-size range of 20 mesh to 325 mesh. The removal of particles smaller than 325 mesh was not studied. From 82 to 98 per cent of the lost-circulation materials such as mica flakes, cellophane, and ground nut shells

Table 1—Results of Laboratory Tests Using an 8-in. Cyclone

Drilling mud and test number—	Underflow orifice diameter (in.)	Pressure (psi.)		Flow rate (g.p.m.)			Barrels rejected material per 1,000 bbl.
		Inches	Overflow	Input	Over	Under	
1. Eola field, Oklahoma, mud	¼	35	0	139.2	138.5	0.7	5.0
2. Eola field, Oklahoma, mud	½	35	0	136.1	133.5	2.6	19.1
3. Eola field, Oklahoma, mud	⅛	30	0	130.0	129	1.0	7.7
4. Eola field, Oklahoma, mud	⅛	45	0	165.3	164	1.3	7.9
5. Eola field, Oklahoma, mud	⅛	60	3	201.7	200	1.7	8.4
6. Eola field, Oklahoma, mud	⅛	30	0	134.5	133.5	1.0	7.4
7. Eola field, Oklahoma, mud	⅛	45	0	165.2	164	1.2	7.3
8. Eola field, Oklahoma, mud	⅛	60	3	201.4	200	1.4	7.0
9. Laboratory mud	⅛	30	0	121.2	120	1.2	9.9
10. Laboratory mud	⅛	30	5	122.1	120	2.1	17.2
11. Laboratory mud	⅛	45	0	140.4	139	1.4	10.0
12. Laboratory mud	⅛	30	0	121.2	120	1.2	9.9
13. Laboratory mud	⅛	45	0	158.6	157	1.6	10.1
14. Laboratory mud	⅛	30	0	125.2	124	1.2	9.6
15. Laboratory mud	⅛	45	0	158.4	157	1.4	8.8
16. Laboratory mud	⅛	60	3	213.9	212	1.9	8.9



EFFECT of cyclone input pressure on the percentage of sand and cuttings between 20-mesh and 325-mesh removed from drilling mud. Fig. 4.



EFFECT of mud density on percentage of lost-circulation materials rejected while removing sand and cuttings from drilling mud with an 8-in. cyclone. Fig. 5.

were reclaimed in the cyclone overflow when treating drilling muds in the density range of 8.5 to 10.5 lb. per gal. Although the 8-in. cyclone removed sand and cuttings from weighted drilling muds, the loss of 5 to 15 per cent of the barite is considered excessive.

The efficiency of removal of cuttings and sand from drilling muds by cyclones was found to be a function of the cyclone input pressure, mud viscosity, and underflow orifice diameter.

Effect of input pressure . . . The data in Table 1 and Fig. 4 show that as input pressure to the cyclone is increased, the percentage of cuttings and sand removed also increases. In field practice, the maximum limit of input pressure would be determined by a compromise of feed-pump capacity, efficiency of separation, and wear on the cyclone.

Based on wear by abrasion, the maximum input pressure for cast iron and rubber-lined cyclones is between 50 and 80 psi. If sand and cuttings are relatively coarse and the mud has a low viscosity, removal of 100 per cent of the sand and cuttings might be effected with an input pressure lower than 50 psi. In addition to reduced wear, low input pressures have the advantage of requiring less pump and engine capacity.

Effect of mud viscosity . . . Tests indicate that as mud viscosity decreases, the efficiency of cutting removal by the cyclone increases. Using a maximum input pressure of 60 psi. when treating muds having a Stormer viscosity of 45 cp., as much as 100 per cent of the sand and cuttings coarser than 325 mesh was removed. At the same input pressure, when the mud viscosity was 60 cp., 93 to 95 per cent of the sand and cuttings was removed. At the same input pressure, when the mud viscosity was 130 cp., 77 to 82 per cent of the sand and cuttings was removed. All of the sand and cuttings coarser than 100 mesh could be removed from muds having a viscosity as high as 130 cp.

Size of underflow orifice . . . As the diameter of the underflow orifice of the cyclone is increased, efficiency of removing sand and cuttings increases but mud loss also increases. When treat-

to Remove Cuttings and Sand From Drilling Muds

Input-mud properties								Overflow-mud properties						
		Screen analysis of cuttings and sand (lb./bbl.)						Reduction of cuttings and sand on screens (%)						
Density (lb./gal.)	Visc. (cp.) Stormer	−20 +30	−30 +60	−60 +100	−100 +200	−200 +325	−20 +325	Density (lb./gal.)	−20 +30	−30 +60	−60 +100	−100 +200	−200 +325	−20 +325
10.4	131	0.06	0.55	0.70	2.98	6.27	10.56	10.35	100	87	70	58	30	44
10.4	131	0.06	0.55	0.70	2.98	6.27	10.56	10.3	100	100	100	80	52	69
10.1	65	0.06	0.64	0.92	2.84	1.84	6.30	10.0	100	100	100	85	76	86
10.1	65	0.06	0.64	0.92	2.84	1.84	6.30	10.0	100	100	100	92	84	92
10.1	65	0.06	0.64	0.92	2.84	1.84	6.30	10.0	100	100	100	100	95	99
11.45	90	0.7	6.00	1.20	2.35	7.35	17.6	11.4	100	100	100	71	60	79
11.45	90	0.7	6.00	1.20	2.35	7.35	17.6	11.3	100	100	100	78	75	87
11.45	90	0.7	6.00	1.20	2.35	7.35	17.6	11.3	100	100	100	85	81	90
11.3	130	0.64	8.18	1.07	3.60	3.24	16.73	11.15	100	100	100	51	37	77
11.3	130	0.64	8.18	1.07	3.60	3.24	16.73	11.15	100	100	100	60	53	82
11.3	130	0.64	8.18	1.07	3.60	3.24	16.73	11.15	100	100	100	55	50	80
10.9	60	0.7	6.3	0.89	2.42	4.67	14.98	10.75	100	100	100	90	85	93
10.9	60	0.7	6.3	0.89	2.42	4.67	14.98	10.75	100	100	100	95	88	95
10.5	45	0.65	5.12	0.82	2.18	4.18	12.95	10.4	100	100	100	97	75	91
10.5	45	0.65	5.12	0.82	2.18	4.18	12.95	10.4	100	100	100	100	85	95
10.5	45	0.65	5.12	0.82	2.18	4.18	12.95	10.4	100	100	100	100	100	100

ing mud having sand and cuttings in the 20 and 325-mesh range, a ⅛-in.-diameter orifice provided the most efficient removal of cuttings with the smallest loss of mud. Smaller orifices often plugged when the cutting and sand concentration of the input mud was high, and larger orifices caused excessive mud loss when the cutting and sand concentration of the input mud was low.

Optimum size underflow orifice on an 8-in. cyclone is approximately ⅛ in. in diameter when treating drilling muds which have passed through a shale shaker. As the concentration of sand and cuttings is lowered by cyclone treatment orifices as small as ¼ in. in diameter can be used. However, orifices as large as ¾ in. have been required when cyclones are first placed in operation to condition a mud which has not passed through a shale shaker. After large cuttings are removed, the orifice diameter may be reduced.

Mud loss from underflow . . . Removal of sand and cuttings from drilling mud by cyclone treatment results in the loss of some mud from the underflow orifice. The volume of mud and cuttings rejected from the underflow in treating 1,000 bbl. of mud with two 8-in. cyclones, according to laboratory and field test results, varied from 7 to 30 bbl. Since the underflow mud consisted of from 50 to 70 per cent sand and cuttings, the actual volume of mud lost varied from 2 to 15 bbl.

Such a loss is probably no greater than the volume of mud normally lost by jetting and settling pit. Yet cyclone treatment removes fine sand and cuttings that in usual operations would continuously recirculate in the mud system causing wear and adversely affecting the properties of the mud.

Reclaiming L.C.M. . . . Careful control of mud weight and retention of lost-circulation materials are necessary parts of the mud program in many areas susceptible to lost circulation. A small increase in mud weight often is the difference between losing circulation and drilling with full returns. The cyclone offers a solution to this problem. When used to treat unweighed drilling muds, the cyclone is capable of reclaiming lost-circulation materials while maintaining a low mud weight by rejecting sand and cuttings.

Although as much as 100 per cent of some lost-circulation materials has been reclaimed, there will be some loss of lost-circulation materials when treating mud with cyclones. Usually, the concentration of the lost-circulation materials in the underflow mud is higher than the concentration in the feed.

Use of standby pump . . . Although feeding a cyclone with the rig standby pump proved satisfactory as far as performance of the cyclone was concerned, withdrawing mud from the suction pit was not satisfactory. To minimize jetting and to provide clean mud at the suction pit, mud pumped to the cyclones should be withdrawn from the first pit and discharged into the second pit. This justifies the use of a centrifugal pump and power unit.

Effect on drilling operations . . . Use of cyclones to remove sand and cutting from drilling mud has resulted in a number of improvements in drilling operations. Compared with operations on an adjacent well, the use of cyclones on the Lipscomb County well reduced mud costs approximately 50 per cent, number of bits required 25 per cent, the number of pump repairs 60 per cent, and increased drilling rate 27 per cent.

Similarly, in other areas pump repairs have been reduced more than 50 per cent by maintaining sand-free mud with cyclones. In both the San Juan County and Ochiltree County wells lost circulation was remedied by maintaining a low-density mud with cyclones. Tests in other areas are also resulting in a reduced incidence of lost circulation. On all wells where the cyclones have been employed, the amount of water required to maintain the mud has been reduced.

Availability and use of cyclones . . . Cyclones for removing sand and cuttings from drilling mud are available to the drilling industry for either purchase or rental. Rental varies from $5 to $50 per day depending upon the number of cyclones and pumping equipment selected.

The benefits of cyclone treatment of drilling muds are not limited to high-cost drilling muds. Advantages have been shown where mud costs are only $0.50 per barrel. In one West Texas area where mud costs are not high, the sand content is usually kept as low as 2 per cent by use of settling pits. Mud weights vary from 9.8 to 10 lb. per gal. One contractor in this area employed one 8-in. cyclone fed by a small portable centrifugal pumping unit to keep the sand content of the mud at 0.2 per cent or less and the weight of the mud from 9.4 to 9.5 lb. per gal. In such an operation as this the use of a cyclone unit costing $25 per day could not be justified, but a small pump from stock and one rented cyclone proved an economical way to keep the mud in good shape and reduce wear on the contractor's equipment.

Paving Asphalt Now in Five Grades

THE ASPHALT INSTITUTE is smoothing the way for road builders by reducing the number of paving grades from nine to five. This will simplify storage and handling for refiners. It will speed delivery of better asphalt to highway builders.

The multibillion-dollar federal road program sparked the move. It has been requested for some time by highway officials, who are now asked to simplify their specifications without sacrificing quality.

As noted below, the intermediate grades, 50-60, 70-70, 100-120 and 150-200 penetration, have been deleted. It is felt that this omission will not affect the quality of the resulting mix.

Asphalt Institute knocked down the number of emulsified asphalt grades from six to four, 3 years ago. It is now working on a simpler grading system for rapid-curing, medium-curing and slow-curing liquid asphalts.

The new listing on paving asphalts looks like this:

SPECIFICATIONS FOR ASPHALT CEMENTS—THE ASPHALT INSTITUTE

Characteristics—	A.S.T.M. method	Industrial and special	Paving			
			60-70	85-100	120-150	200-300
Penetration, 77° F., 100 g., 5 sec.	D 5	40-50	60-70	85-100	120-150	200-300
Flash point (Cleveland Open Cup), °F.	D 92	450+	450+	450+	425+	350+
Loss on heating, 325° F., 5 hours, per cent	D 6	1—	1—	1—	2—	2—
Penetration after loss on heating, 77° F., 100 g., 5 sec., per cent of original	D 5	70+	70+	70+	70+	60+
Ductility:						
At 77° F., cm.	D 113	100+	100+	100+	60+	. .
At 60° F., cm.	D 113	. . . .	. . . .	. . . .	. . . .	60+
Solubility in carbon tetrachloride, per cent	D 4*	99.5+	99.5+	99.5+	99.5+	99.5+
Temperature of use:						
For spraying, °F.	. . . .	275-350	275-350	275-350	275-350	275-350
For mixing, °F.	. . . .	275-325	275-325	275-325	275-325	200-275

*Except that carbon tetrachloride is used instead of carbon disulfide as solvent, Method No. 1.

Evangeline expansion program includes . . .

Satellite Push-Button Pipeline Stations

by Larry Resen
District Editor

A MULTIPHASE expansion program now under way on the Evangeline Products System's 16-in. line will up its present 129,000-bbl. per day capacity to an ultimate capacity of 170,000 bbl. per day.

Satellite, push-button stations are the prominent feature of the expansion program. Two new booster stations, at Jennings and Port Barre, La., plus the original booster station at Lake Charles, La., will provide complete push-button control from the originating pump station at Port Arthur, Tex. All three booster stations run unattended at night when the Port Arthur station is pumping. The Port Arthur pumps are shut down whenever the Lake Charles station is delivering products into the line. At these times, the Lake Charles station is attended.

The two new stations use Nordberg dual-fuel gas-diesel engines as prime movers while the Lake Charles and Port Arthur stations are equipped with electric motors. The Jennings station, with two engines installed, has been operating on push-button control since July 1956. A third engine is being added there and the Port Barre station is also being constructed with three engines. Station Construction Co., Houston, is prime contractor on the stations. When facilities are completed, pumping horsepower on the 16-in. line will total 17,220.

Owners and shippers . . . The Evangeline system is a products carrier which runs from Port Arthur to Baton Rouge where it terminates at Plantation Pipe Line Co.'s station. Most of the products handled are then shipped farther through Plantation.

Texas Pipe Line Co. operates the system for its undivided interest owners which are: Texas Pipe Line, Gulf Refining Co. (Pipeline Department), Sinclair Pipe Line Co., and Teche Pipe Line Co. The line was originally placed on stream in September 1953, with an initial daily capacity of 96,000 bbl. *(The Oil and Gas Journal, October 26, 1953, page 61; and November 9, 1953, page 92).* Products are received from Gulf and Texas refineries at Port

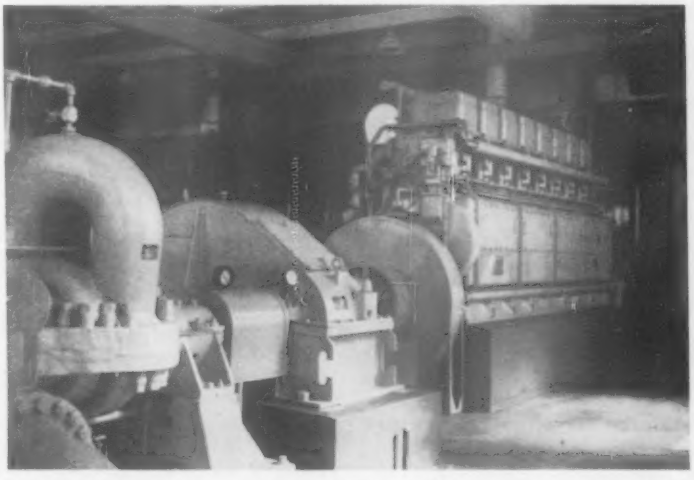
Station data on Evangeline Products System

Port Arthur:
One 1,250-hp. Marathon electric motor; two-stage U.I.W. centrifugal pump.
One 1,250-hp. Westinghouse electric motor; two-stage U.I.W. centrifugal pump (new).
One 800-hp. Marathon electric motor; two-stage U.I.W. centrifugal pump.
One 400-hp. Marathon electric motor; single-stage U.I.W. centrifugal pump.
Eleven 80,000-bbl. steel floating-roof tanks.
Three 45,000-bbl. steel floating-roof tanks.
One 5,100-bbl. cone-roof utility tank.
Four 80,000-bbl. steel floating-roof tanks (new).

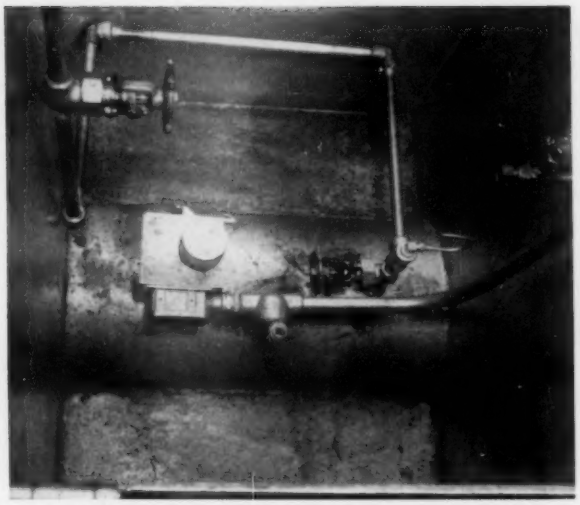
Lake Charles:
Two 800-hp. Marathon electric motors; two two-stage U.I.W. centrifugal pumps.
One 800-hp. Westinghouse electric motor; two-stage U.I.W. centrifugal pump.
One 800-hp. Westinghouse electric motor; two-stage U.I.W. centrifugal pump (new).

Jennings:
Three 1,720-hp. Norberg gas-diesel engines; three four-stage U.I.W. centrifugal pumps; three Farrell-Birmingham gears.
One 2,000-bbl. fuel tank.

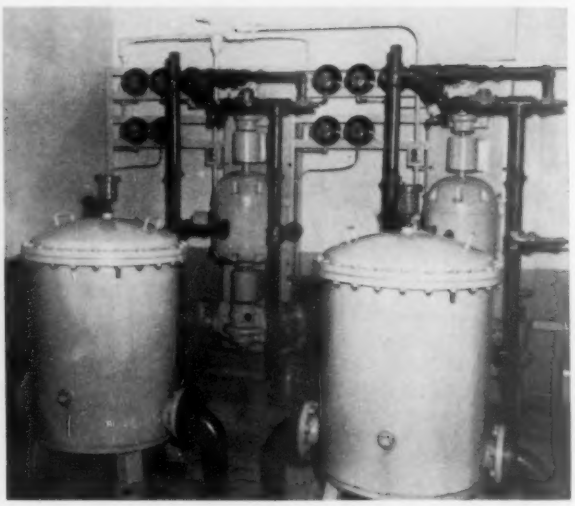
Port Barre (new):
Three 1,720-hp. Nordberg gas-diesel engines; three four-stage U.I.W. centrifugal pumps; three Farrell-Birmingham gears.
One 2,000-bbl. fuel tank.



NEW STATIONS will be equipped with three 1,720-hp. dual-fuel engines driving four-stage centrifugal pumps.



AUTOMATIC SCRAPER DETECTOR permits pigs to bypass station by opening and closing necessary valves.



ELECTRIC MOTORS driving lube-oil and jacket-water pumps are mounted vertically to conserve floor space.

Arthur; from Sinclair's Houston refinery, whose products are transshipped to the Port Arthur station; and from Cities Service Refining Corp.'s Lake Charles refinery. Increased capacity will permit Pure Oil Co. to ship products from its Nederland refinery near Port Arthur.

When the expansion program is completed, main-line prime movers (see box) will include two 1,250-hp., one 800-hp., and one 400-hp. electric motor at Port Arthur; four 800-hp. electric motors at Lake Charles; three 1,720-hp. dual-fuel engines at the Jennings station; and three 1,720-hp. dual-fuel engines at the new Port Barre station.

Products are delivered to Gulf at Opelousas, La., through a stripper operation on the main line, and to Gulf and Texas near Baton Rouge. However, the major movement is into Plantation tankage at Baton Rouge.

System operation . . . The Lake Charles station serves both as a booster and as the originating station for Cities Service products. When Cities Service products are pumped from Lake Charles, the Port Arthur-Lake Charles portion of the line is shut in, and the system operates only between Lake Charles and Baton Rouge. Control of the downstream stations is still handled out of Port Arthur.

The onstream-offstream operation of the Lake Charles and Port Arthur stations is accomplished with no lapse in pumping, no dropoff in pressure, and no commingling of products. Initially, Cities Service delivers products through a 16-in. line running from its refinery to the Lake Charles Evangeline station. A 6-in. purge line is tied in as part of this feeder system. When Cities Service is to tender a different product, the product remaining in the line is purged back to the plant. This is continued until the product of the proper gravity is at the delivery meter, ready to be pumped into the line.

The pumping units at Cities Service's refinery are then started 2 minutes before the main-line interface is due to arrive. The main line is then cut off under pressure and the Lake Charles tender delivered under pressure, thereby preventing any commingling. The Port Arthur pumping units are shut down during the Lake Charles delivery period. These are then started up 2 minutes prior to the termination of the Lake Charles tender. The main line is cut back on stream with no loss of pressure.

Satellite stations . . . The Jennings and Port Barre stations are being constructed from the same set of drawings, making each identical with the other in all respects, except engine rotation. The first one built will be at Jennings.

Three 1,720-hp. Nordberg Supairthermal gas-diesel engines are used to drive three United Iron Works four-stage centrifugal pumps. The engines are dual-fuel units, starting up on diesel fuel and switching over automatically to dual fuel for normal operation.

To start up one of the satellite stations, the Port Arthur operator first observes the station cut-through pressure which is telemetered to the central control board. He then presses a button which opens the station suction valve and another button to close the station main-line block gate. This arrangement will then route the full stream into the station loop. A second button is then pressed to begin the unit start sequence. The pump-room ventilation blowers, the engine crankcase vent blowers, the auxiliary lube and jacket-water pumps, and the turbocharger lube pumps are started approximately 5 minutes before the engine turns over. During this prestart period, the suction and discharge valves to the main pump open.

Dual-fuel operation . . . At the end of this initial 5-minute period, the starting air solenoid opens, admitting air to the unit. The unit starts on full diesel operation and comes up to idling speed. The water-pump discharge pressure opens the circuit on the solenoid valve which cuts off the starting air supply. The unit runs idle for approximately 5 minutes after which the line controller goes into operation and allows the unit to speed up as dictated by the incoming and outgoing station pressures. This pneumatic controller operates to speed up or slow down the equipment to maintain a minimum suction pressure and a limited discharge pressure within the allowable speed range of the equipment.

After the unit has been operated a short time and the engine lube-oil temperature reaches approximately 140° F., the unit converts automatically to dual-fuel operation with approximately 8-10 per cent diesel fuel as pilot oil and the remainder natural gas. Should the gas supply to the station fail, the units will automatically convert back to full diesel operation. Diesel fuel is received from the main line and stored in a 2,000-bbl. tank at the station.

If the unit should fail to start, the starting air solenoid will reenergize for 4 seconds and close for 20 seconds, giving the engine a second chance to start. This is repeated a third time if necessary. Should the engine fail to start after the third effort, a shutdown relay will energize to shut down and lock

A CLOSED COOLING-WATER system is used, with the water being cooled by incoming products stream in these parallel shell-and-tube exchangers.

out the unit. Each of the two engine-powered stations can maintain full line capacity with two units operating if necessary.

When the operation of the first unit levels out, the operator at Port Arthur pushes a button to start the second unit and its startup sequence is identical with that of the first. However, the instant the suction valve is opened on the second unit, the first unit will slow down to permit the station suction pressure to build up for a short period of time while the second unit is being started. After the second unit has been operated for 5 minutes, speed of both will increase and be controlled by the same pneumatic speed-control system. When the third unit is put on stream, the first two units will slow down when the suction and discharge valves are opened on the third unit. The speed of all three will then be increased after third unit has operated 5 minutes and all will be controlled by the pneumatic speed controller.

Control and protection . . . Each pumping unit is protected against:

. . . Engine overspeed.
. . . High-water temperature.
. . . Low lube-oil pressure.
. . . Vibration.
. . . High bearing temperatures (gears protected at four points).
. . . Excess pump-seal leakage (two points).
. . . High pump-bearing temperatures (two points).
. . . High pump-case temperature (one point).

The station is also protected against abnormally low suction pressures, abnormally high discharge pressures, and spillage of product. Any product lost in the pump room is picked up in floor drains and carried into the sump. This small sump is equipped with a float and switch which will actuate emergency shutdown devices if leakage becomes serious.

A common pneumatic system is used to protect the gears and pumps against high temperatures and seal leakage. The nine points of protection are connected with a single copper-tube air-supply line per unit. One mercury switch located in the auxiliary room is used to respond to any of the nine protection points.

Each unit is equipped with a vibration switch that comes into operation automatically after the unit has converted to a dual-fuel operation. When the unit shuts down, a spring and lever cocks the vibration switches in case they have tripped during a shutdown.

The water temperatures of each unit are controlled by three-way temperature-control valves which maintain outlet water temperature of 160° F. and

EXCESSIVE LEAKAGE within pump room will accumulate in sump equipped with a high-level shutdown control.

"A scraper detection unit is incorporated to permit scrapers to bypass the station automatically."

turbocharger discharge air temperatures of 100° F. Shell-and-tube heat exchangers are used for cooling purposes on the closed system. The full products stream entering the station is routed through two exchangers connected in parallel. Approximately one-third of the engine circulating water passes through the exchangers and is cooled to provide a large temperature drop in this portion of the cooling water. This water is routed through the lube-oil cooler and turbocharger cooler to provide necessary cooling in these two heat exchangers. The water is then blended with two-thirds of the water which shunts the exchangers and this combined stream passes through the engine jackets.

A scraper detection unit is incorporated to permit scrapers to bypass the station automatically. An incoming scraper will trigger the controls so that the units slow down while a bypass opens between the suction and discharge lines. The station block gate opens and the station suction valve closes. As soon as the scraper moves past the block gate it triggers a second sensing element. This causes the valves to realign themselves to their original operating position and the engines resume normal speed.

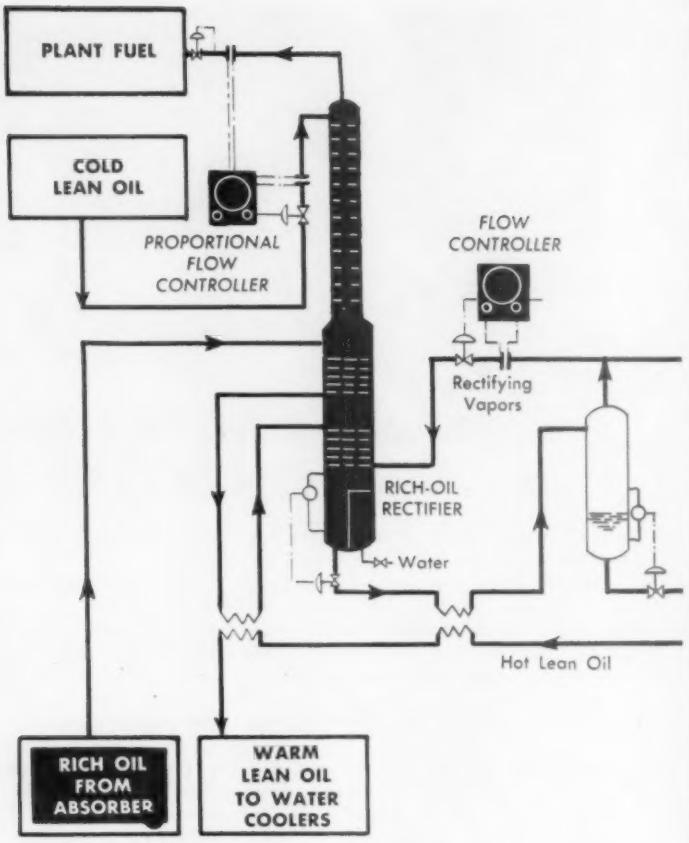
Auxiliary equipment . . . Auxiliary equipment for the station includes a 50-kw. power unit which supplies station electricity. The generator is driven by a four-cylinder, 75-hp. engine. Should this unit fail, outside power is cut in automatically and instantaneously to maintain station operation. The instantaneous feature dictated that the outside power be used as the standby since the delay necessary to start up the auxiliary diesel-generator set would require the station to come down temporarily. A set of batteries is maintained under charge so that in event of complete power failure there will be sufficient current to actuate emergency shutdown relays and equipment. High-pressure connections have been minimized within the pump room by locating as much piping and fittings as possible outside.

Acknowledgments

The cooperation of the management of the Evangeline Products Systems and Texas Pipe Line Co. is gratefully acknowledged. The cooperation and assistance of Jess Chandler and A. S. Peterson, Crowley, La., and Marshall Bagwell, Houston, all three of Texas Pipe Line, is also appreciated.

by G. L. Farrar
Engineering Editor

Rich-Oil Distillation Proved in Use



Fourteen plants are now using the cycle

THE Ragatz process cycle for the distillation of rich absorption oil has proved itself in natural-gasoline-plant operation. Fourteen operating plants are now using the cycle, and four more plants now building, or soon to start building, will utilize it.

As shown in Table 1, the four plants under construction range from small to large in the amount of gas to be purchased, and the gasoline content of the gas varies from "normal" to very lean.

The rich-oil distillation cycle has several advantages:

● **Precise control of light-product quality.** Operators of many rich-oil deethanizers have been disappointed by the failure of their units to achieve anticipated light-product retentions and/or quality controls. Such failures, however, can be largely laid to the use of conventional temperature controls at these units.

This control is inadequate for the rectifier operation in that the large-percentage volumes of low-pressure lean oil in the rich-oil stream make the system extremely sluggish temperature-wise to significant changes in light-product quality.

On the other hand, the light-product content of the rectified rich oil is very responsive to measurable changes in rectifying vapor rate. This may be precisely controlled by direct measurement and adjustment of the volume of vapors thus employed.

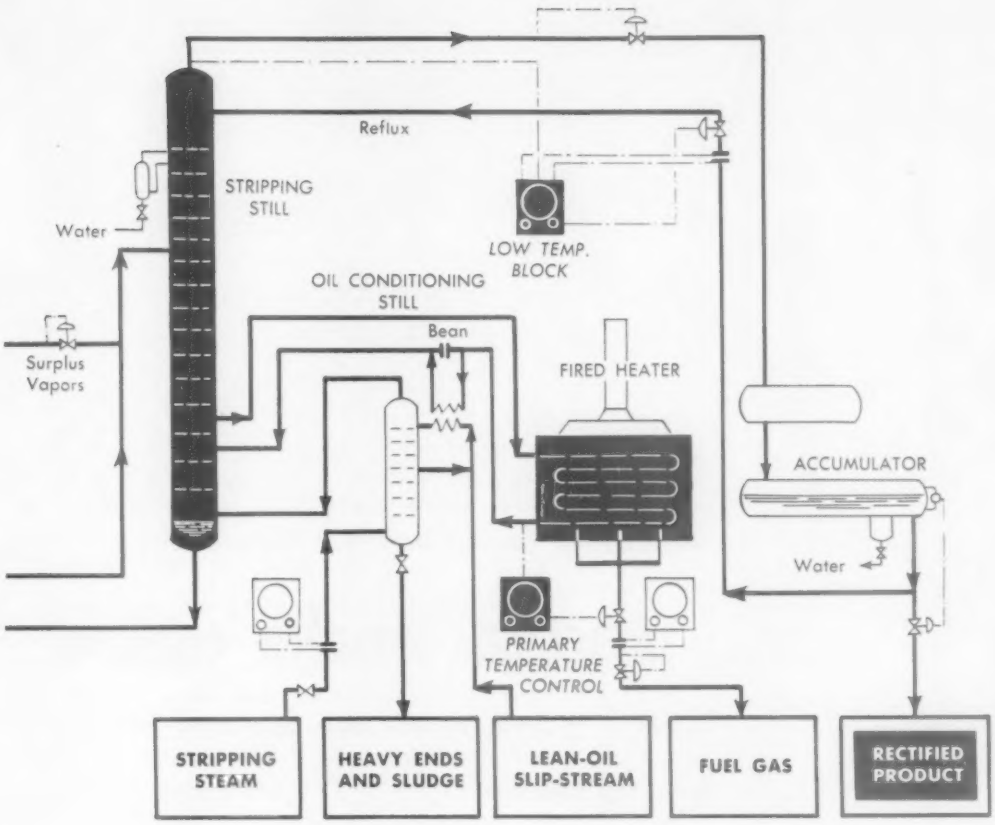
● **Efficient recovery of lean-oil heat.** The conventional rich-oil deethanizer interchanges hot lean oil with the column bottoms for final heat recovery. This results in excessive discard of useful lean-oil heat to the cooling tower. While this high heat loss can be avoided by additional interchanging with the rich-oil feed of the column, such recovery calls for a marked increase in reabsorption oil circulation for a given component retention.

By employing one or more "side interchange" circuits at the rich-oil rectifier, its recovery of lean-oil heat can be materially increased with little or no increase in reabsorption oil circulation.

● **Operating flexibility.** Rectifying pressures for least fuel use and corresponding optimum percentage distributions of recovered lean-oil heat, vary markedly with changes in rich-gas quality and light-product composition or production rate.

By using only a single high-temperature interchanger assembly, and independently splitting the resultant vapor stream between the rectifier and still, flexibility may be gained without expensive bypass controls at the interchangers. All of the interchanger surface will thereby be used at top efficiency at all times.

● **Proper location of still fired-heater.** The still fired heater is usually located on the rich-oil feed stream to the still. This was relatively satisfactory for earlier operations with low propane recoveries and lean-oil mole weights of 200 and higher. But it is wasteful of fuel when applied to today's propane recoveries. It also hampers effective lean-oil fractionation



RICH-OIL distillation cycle provides for efficient heat recovery, operating flexibility, effective control of lean oil concentration, and precise control of light-product quality.

and four now building will adopt it

when lean-oil mole weights much below 180 are used in the absorption system.

By moving the fired-heater to its proper reboil location, still reflux ratios (and hence fuel requirements) are substantially reduced. And the lean oil is so sharply fractionated that mole weights of 165 are readily attained with little or no accompanying lean-oil makeup.

● **Effective control of lean-oil light ends.** In the majority of recovery operations, a true reboiled stripping still may be operated to hold a relatively low mole weight with no lean-oil make-up. This desirable operating balance, however, requires the recovery and concentration of intermediate-boiling fractions present in the lean gas in very small amounts.

While such recovery and concentration may take weeks after the the initial startups, the resultant low mole-weight oil can be destroyed in a matter of hours by an overhead distillation of its front-end fractions. Such front-end loss is guarded against in this process cycle by a dual control, interlocking an appropriate midcolumn temperature with the overhead vapor temperature. Each control has an appropriate "stop."

● **Effective control of lean-oil heavy ends.** The rich-gas stream contains small concentrations of undesirable higher-boiling fractions as well as desirable intermediates. For attainment of lowest lean-oil mole weights, these heavier fractions must be removed from the plant-system oil along with the conventionally removed sludges.

Such removal without associated loss of desirable intermediate fractions requires use of a fractionating lean-oil conditioning still. This is provided.

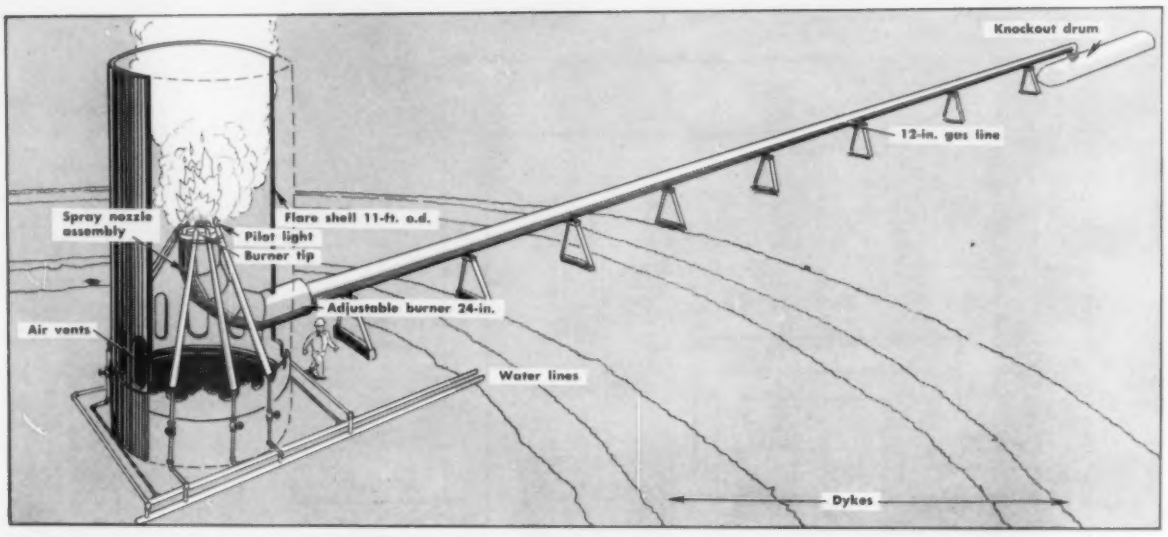
The process is licensed by Edward G. Ragatz Co., process engineers, San Marino, Calif.

Reference

Ragatz, E. G., "Operating the Rich-Oil Rectifier," The Oil and Gas Journal, January 14, 1952, p. 107.

TABLE 1—NEW PLANTS USING RAGATZ PROCESS CYCLE

Company, plant location, and status—	Gas capacity, M.M.c.f.d.	Liquid products, to. gal./day	Builder
Sunray-Mid-Continent, Carney plant, Carney, Okla. **Building.**	17.5	25,000	Tuloma Builders
Continental Oil Co., Short Junction plant, Moore, Okla. **Building.**	60	140,000	Tuloma Builders
El Paso Natural Gas Co., Chaco plant, Bloomfield, N. M. **Soon to start building.**	165	190,000	Probably El Paso Natural
Union Oil & Gas Corp. of La., Eunice plant, Eunice, La. **Building.**	315	.....	Fluor Corp., Ltd.



By the use of this plant-designed and built system, Eastern States has achieved . . .

Low-cost, practical smoke control

Well-behaved flares are a big aid in winning friends and popularity

by Herschel Martin

REFINERY flares are indispensable safety devices. Operating upsets can bring about pressure or temperature conditions that would be unsafe in the refinery's equipment. It is sometimes necessary to release large amounts of hydrocarbon from the equipment. The only known way of safely handling such a large amount of highly flammable material is to put it into the plant flare system until the upset can be corrected.

Originally, flares at Eastern States Petroleum Co. were installed as safety devices, and with little concern over air pollution. But management realized that excessive smoke from the refinery could be a serious problem. The engineering department was asked if the refinery flares could be adapted to a smokeless operation. A survey of literature and installations in other refineries was made. A test program and design of smokeless equipment was then undertaken.

The Designer's Problem

The difficulty in designing a refinery flare that will burn with a smokeless flame is that the designer does not know what hydrocarbon mixture will be sent to the flare. Neither does he know how much of the material it will be necessary to burn at any given moment. So the designer does have his problems, but they are offset somewhat by one fact. If hydrocarbons are the only material going to the flare the designer need only make the flame of his flare smokeless and he has succeeded. There are few, if any, worries about flame length or efficiency. The chief concern is to burn the hydrocarbon completely and quickly to water vapor and CO_2 with as little smoke as possible.

Supply oxygen . . . The question "what is smoke" doesn't seem to have an exact answer. In the case of a burning hydrocarbon, it has been said that smoke was caused when carbon was separated from the hydrocarbon compounds by thermal cracking and these particles of carbon cooled below the incandescent temperature in an atmosphere that did not contain enough oxygen to support combustion. The one thing then that must be done is to supply enough oxygen to the flare to properly support the combustion and prevent those smoke particles from forming.

Venturi-type burners . . . There are several methods that can be used to supply the necessary oxygen in the varying amounts needed to make a flare smokeless. As an example of one method, some refineries use a venturi type of air aspirating burner. This burner is of a conventional design which utilizes a gas orifice and venturi type of the correct ratio for optimum firing conditions. These burners can be fired horizontally against an air-cooled masonry wall. In order to handle the variable volumes of gas, several burners may be arranged in parallel. Automatic pressure control systems can be installed to control the number of burners being fired at any one time. A relatively high back pressure on the flare line will fire all the burners simultaneously, while a low back pressure may actuate only one or two of the burners. Individual pilot lights on each burner will insure ignition.

Disadvantages . . . The advantage of this system is that it uses conventional burners for supplying the necessary excess oxygen for combustion. The disadvantages are:

1. A correct design ratio of gas to

Author is with Eastern States Petroleum Co. at Houston. Paper presented at Air Pollution Control Association meeting, Houston. Entire program will appear in A.P.C.A. proceedings.

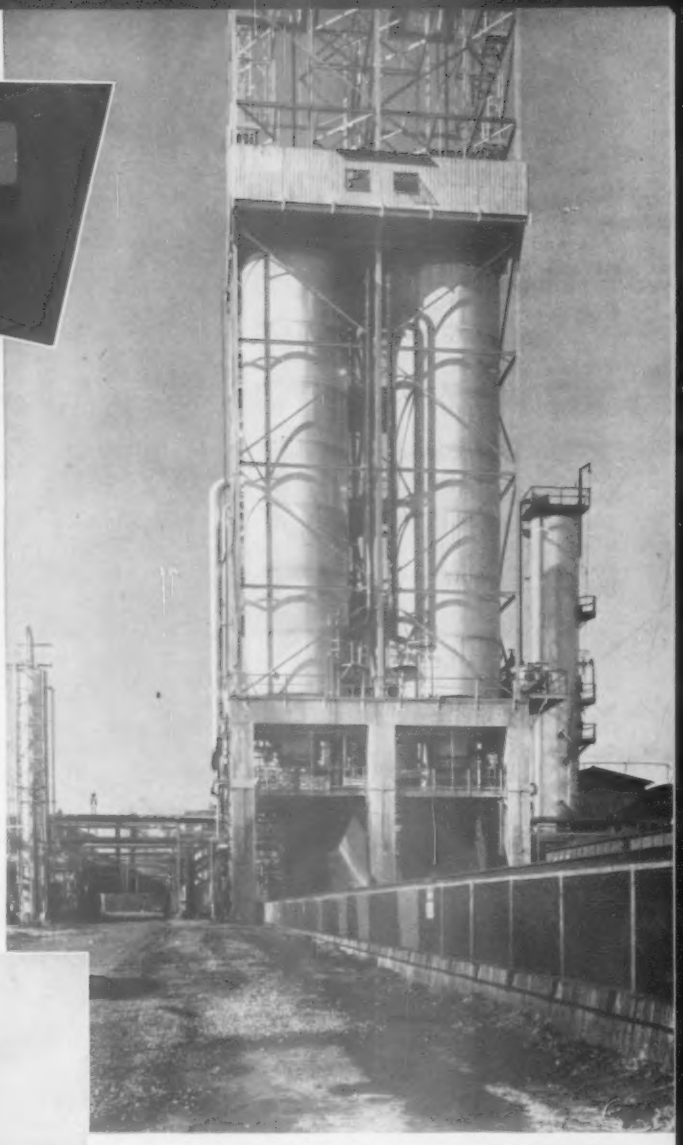
REFINING

HORTONCLAD and CB&I Vessels

Hortonclad Plates Utilized in fabrication of crude fractionator and coking chambers

Hortonclad®, a composite corrosion-resistant metal having an integral and continuous bond produced by a high vacuum brazing process, was used in the fabrication of the two process vessels shown here, built by CB&I.

Hortonclad, available only with CB&I storage and process vessels, may be had in silver, nickel, Monel, Inconel, Hastelloy, stainless steels (both chromium and chromium-nickel) and a wide variety of other metals and alloys. Further information on its use with CB&I vessels may be obtained by writing our nearest office.



▲ 405 STAINLESS STEEL HORTONCLAD was used in the fabrication of these two 16-ft. diam. by 65-ft. high coking chambers by Chicago Bridge & Iron Company.

◀ MONEL HORTONCLAD and CHROME-NICKEL STAINLESS HORTONCLAD were used in building this 15½-ft. by 142-ft. crude fractionator by CB&I. The top head and upper portion of the shell was Monel Hortonclad. Chrome-nickel stainless Hortonclad was used in the bottom head and lower portion of the shell.

CB&I

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
New Orleans • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • South Pasadena • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.
REPRESENTATIVES AND LICENSEES:
Australia, England, France, Germany, Italy, Japan, Netherlands, Scotland
SUBSIDIARIES:
Horton Steel Works Limited, Toronto; Chicago Bridge & Iron Company Ltd., Caracas;
Chicago Bridge Limited, London; Sociedade Chibridge de Construcoes Ltda., Rio de Janeiro.

venturi orifice for one type of gas can hardly be correct for all gases and under some conditions the flare will therefore produce smoke.

2. This type of system requires elaborate and expensive pressure and flow-controlling equipment.

Use blowers . . . Another method of eliminating smoke from burning hydrocarbons in flares is to supply the necessary excess air with blowers or compressors. This method is excellent for burning any type of hydrocarbon gas without smoke for the air supply can be increased in proportion to the amount of hydrocarbons to be burned. The obvious drawback of this method is the expense of the installation.

Inject water or steam . . . A third, and more commonly used, method for suppressing smoke in refinery flares is the injection of either water or steam directly into the flare. If either water or steam is proportioned correctly the flame will be smokeless. There are two theories as to why this occurs. One theory advanced by William A. Bone and Donald T. A. Townsend in a text entitled "Flame and Combustion in Gases," is that water vapor and steam in the presence of burning hydrocarbons react with incandescent carbon to form hydrogen and carbon dioxide at temperatures below 1,832° F.

In reactions above this temperature, the products are hydrogen and carbon monoxide. Carbon monoxide, being unstable by nature, further oxidizes in the presence of air, taking on more oxygen to form carbon dioxide. The hydrogen reacts to water vapor. Another theory is that the water vapor cools the flame, preventing cracking and polymerization of the burning hydrocarbons. The flame therefore produces little or no elemental carbon and as a result is smokeless.

Either or both of these theories could be the answer. In any event, it is known by experience that when hydrocarbon burns in the presence of the correct amount of water vapor, complete combustion occurs.

The engineering department concluded that the third method, that is steam or water injection into the flame of the flare, was the most suitable for trial on the existing flares at the Eastern States refinery. An engineer was assigned the job of designing and testing the smoke-suppressing equipment for these flares. The only real problem in the design of this type of smokeless flare is to insure that the proper amount of water vapor is present at the proper moment. This could be done by installing automatic equipment to regulate the water or steam pressure to the smoke-suppressor equipment in proportion to the flow of the gas to the flare. This would work very well if there were only one type of gas to be burned.

However, as mentioned earlier, the flared gases are likely to be composed of many different hydrocarbons. The exact composition of the gas cannot be predetermined and it is therefore impossible to determine any one correct setting for the automatic equipment for all types of flared gas. At the present, steam and water injection is controlled manually in many refineries using smoke-abatement equipment of this type.

In the latter part of 1953 a steam-spray type of smoke suppressor was designed and installed on a small elevated flare at Eastern States. This installation proved to be very effective in eliminating smoke in this particular flare but the flare was a small one and the amount of steam used would be excessive if proportioned up for a larger flare.

Water spray . . . Early in 1954, a series of experiments was conducted on a large spare ground flare. To conserve steam, it was decided to experiment with the water-spray injection method of smoke suppression. Water was available at 60 psi. and seven 1-in. and one 2½-in. water lines were tied into the flare. Each line was separately valved for individual control and each line had a pressure gage between this valve and the flare. With this setup several types of spray nozzles and a standard 2½-in. fog nozzle were tested in various combinations.

Spray-nozzle results . . . The results of this test showed that the fog nozzle was of no value in suppressing the smoke. A single large solid-cone spray nozzle did not effectively atomize the water and therefore delivered an excessive amount of useless large water droplets into the flare. However, the smaller solid-cone spray nozzles were very effective, especially when the spray was directed into the base of the flame. They were most effective when similar spray nozzles operated simultaneously around the circumference of the flame. With these small nozzles supplying water to the base of the flame in the spare flare, the flame was completely smokeless.

With this test completed the design of the smokeless equipment for the main flare was undertaken. This main flare is a vertical steel cylinder 12 ft. in diameter by 70 ft. high. It is lined with about 8 in. of refractory material to protect the shell from the heat. This cylinder sets in the center of two concentric earthen dikes which were built to hold any burning liquid which might spill from the flare.

The flare is fed by a 12-in. pipe from the refinery venting system which passes through a large knockout pot about 100 ft. from the flare. The purpose of this pot is to collect any liquids which might condense out of the vapors en route to the flare. These liquids are pumped back to the refinery waste-oil system.

The 12-in. line enters the shell of the flare about 15 ft. from the bottom. It enters through a 24-in. pipe and these two concentric pipes, which are of stainless steel at this point, turn upward in the center of the flare. The inner pipe carries the hydrocarbon to be flared and the outer pipe serves as a channel for the primary air of combustion. Secondary air is provided by large reinforced ports cut in the base of the flare cylinder. A pilot light is kept burning near the tip of the 12-in. burner.

The entire flare may be blocked off and the vent gas system directed to a spare flare when it is necessary to make adjustments or repairs to the main flare. This flare is not new but has been in service for years. It always handled safely any refinery flaring load. There was one drawback: when the load to the flare was heavy, it omitted clouds of black smoke.

Seven spray nozzles . . . The smoke-suppression equipment designed for this flare consisted of seven spray nozzles arranged around the burner tip on a 36-in. circle about 3-in. above the tip. Four small nozzles were placed at 90° and three slightly larger ones at 120°. The bank of three nozzles and the bank of four were each supplied with water through separate headers and the flow to each could be manually regulated. All of the spray equipment, lines, and nozzles were of stainless steel.

Manual control . . . Whenever an upset in the refinery causes hydrocarbon to be sent to the flare it is an easy matter for an operator to regulate the water flow to the smoke-suppression equipment and eliminate the smoke. This elimination of smoke is nearly always complete. The operator who handles this equipment works at a unit about 100 yards from the flare and there can be a delay in the adjusting of the water spray. The engineering department is considering replacing the manual valves with remote air-operated control valves which may be regulated from the unit control house. If this is done, the small delay will be eliminated. At this time it is not thought necessary or practical to install any automatic control equipment on the flare. **End.**

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Thoughtful men are beginning to ponder a challenging subject. Here is how one group contributed ideas on the question:

Where'll tomorrow's energy come from?

. . . Liquid fuels from oil shale and coal

by W. C. Schroeder
University of Maryland

THE major items that make up the cost of productive capacity for petroleum and synthetic-liquid-fuel operations are as follows:

Petroleum—exploration and production, transportation and refining, and distribution.

Synthetic liquid fuels—mining, processing and refining, and distribution.

In petroleum operations, it is readily possible to calculate the capital cost of productive capacity for transportation and refining, but much more difficult to arrive at an estimate for the overall investment when exploration and production are included. It is also known at the present time that the first item — exploration and production — makes up about 70 per cent of the capital cost in the United States.

J. E. Pogue and K. E. Hill[1] have presented data on financial requirements for the industry which make possible the estimation of the average cost of productive capacity for the period 1951-55, 1956-60, and 1961-65. Table 1 shows their estimate for the indigenous supply of crude oil and natural-gas liquids up to 1965, and the expenditures in terms of 1955 dollars required to maintain this capacity.

These expenditures must provide for additions to capacity as well as the replacement of depleted capacity as shown in Table 1.

[1] A special Journal report, taken from papers at the recent Energy Resources Conference, Denver.

A Formula for Calculating

Replacement of capacity . . . The calculations are based on a reserve life of about 12 years, which is about normal for the United States. For the 5-year period the amount of productive capacity to be replaced is then estimated as 5/12 of average production during that period. However, in calculating replacement capacity, exploration, and production have been taken separately at 70 per cent of the total cost, and refining and distribution at 30 per cent. It should also be noted depreciation of the 30 per cent was based on a 20-year period.

Under these conditions, if V is equal to the average capital cost in dollars per daily barrel of petroleum production (including production, refining, and distribution) for new and replacement capacity, then for the 1950-55 period, V may be estimated as follows:

$$1{,}589V \times 1{,}000 + \frac{(5{,}906 + 7{,}495)}{2} \times 5/12 \times 0.7 \times V \times 1{,}000$$

TABLE 1—CAPITAL COST OF PRODUCTIVE CAPACITY FOR CRUDE OIL AND NATURAL-GAS LIQUIDS FOR U. S. (ESTIMATED)

	1950	1955	1960*	1965*
Petroleum supply, thousand barrels per day	5,906	7,495	8,870	9,870
Expenditures, billions of dollars for 5 years	24.0	32.9	40.6	
Increased capacity in 5 years, thousand barrels per day	1,589	1,375	1,000	
Replacement of depleted production, thousand barrels per day	2,800	3,400	3,900	
Average capital cost of new and replacement capacity, dollars per barrel of petroleum per day†	5,900	7,500	9,200	

*Projections based on 1955 dollars. †Includes capital cost of production, refining, and distribution facilities.

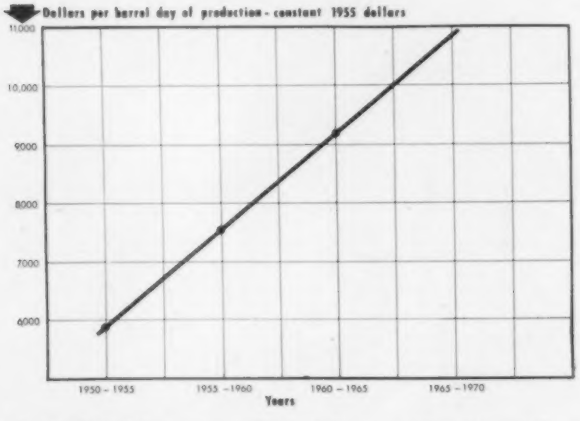

Fig. 1—Estimated average capital cost for new and replacement production in the United States. (Constant 1955 dollars.)

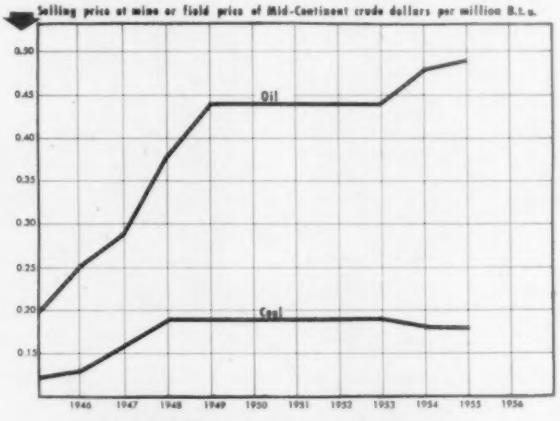

Fig. 2—Selling price of coal and crude oil.

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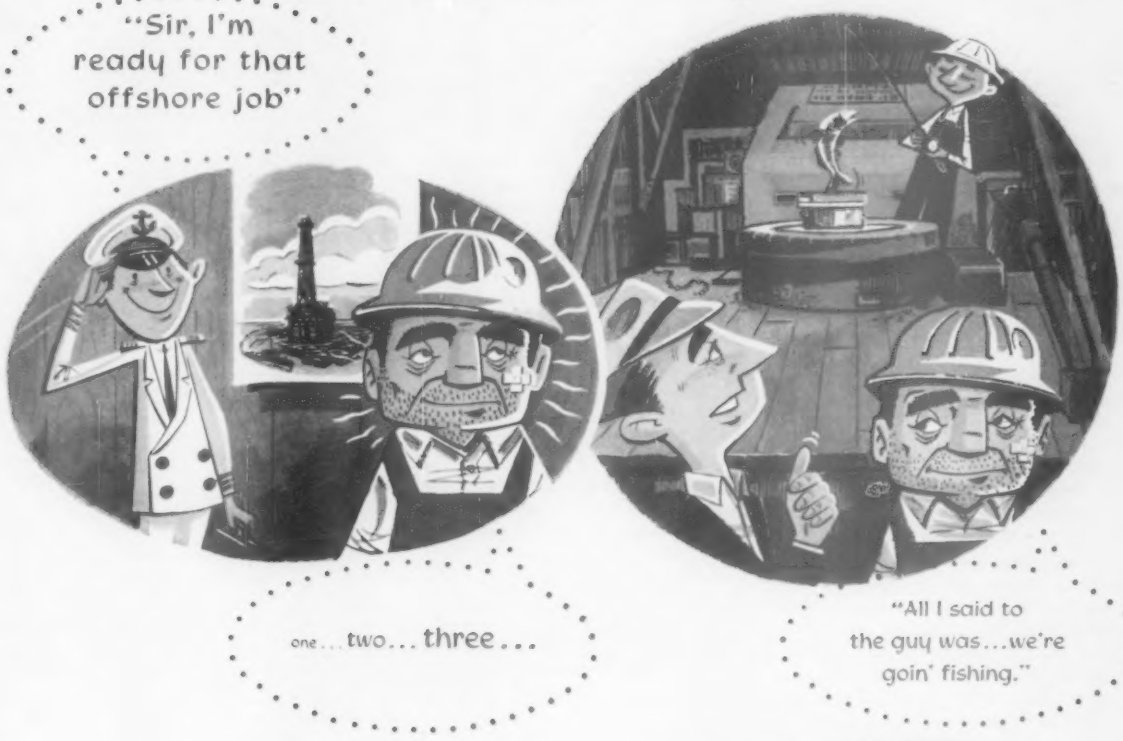

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$$+ \frac{(5{,}906 + 7{,}495)}{2} 5/20 \times 0.3V \times 1{,}000 = 24{,}000{,}000{,}000$$

or V = $5,900 per barrel per day of petroleum productive capacity. For the other 5-year periods the capital cost is estimated in the same way.

On this basis the average capital cost of new and replacement capacity is expected to rise from $5,900 for 1950-55, to $9,200 for 1960-65. Fig. 1 shows that the capital cost is increasing along a straight line so far as can be judged from the three points available. It should be noted that these estimates are based on 1955 dollars and are not influenced by inflationary trends.

Shale oil . . . The capital cost of shale-oil production capacity including refineries and a pipeline to California was estimated at $7,000 per barrel of crude shale oil per day in 1951. If these estimates are corrected to 1955, the capital cost is about $8,000 per barrel per day.

These figures indicate that shale oil should have an advantage over domestic petroleum with a lower capital investment per barrel day of production in the period 1960-65. In addition, the shale-oil productive capacity could be established with shale reserves for 20 or more years, compared to the average life of petroleum reserves of 12 years. This means that the demand for capital for the future for the shale industry would be much less than for petroleum.

Coal hydrogenation . . . Capital cost of a coal-hydrogenation plant was estimated by different groups in the range between $12,000 and $16,000 per barrel of products per day in 1951. The estimates are subject to corrections to place them on a comparable basis with the capital requirements for petroleum in 1955. First, they must be increased by about 16 per cent for inflation. Second, they are based on hydrogenation-plant output, whereas petroleum capacity is oil production at the well.

On the assumption that there is an over-all volume lost between the well and the output of the refinery of about 10 per cent (including the oil used for fuel in the refinery as a loss), the estimates should be decreased by about this amount. Third, the output from a coal-hydrogenation plant is 75-80 per cent gasoline compared to 50-70 per cent in petroleum refining. This has been assumed to be another 2 per cent in favor of coal hydrogenation. The final correction for coal hydrogenation (petroleum equivalent) is plus 4 per cent which puts the cost in the range $12,500 to $17,000 per barrel per day of capacity.

Fischer-Tropsch . . . Cost of productive capacity for the Fischer-Tropsch process was estimated in the range of $11,000 to $13,000 per barrel per day at 1951 costs. Applying corrections as previously indicated, the capital cost for the Fischer-Tropsch process (petroleum equivalent) would be about $11,500 to $13,500 per barrel per day.

At the present time about the best that can be done in the way of capital requirements for synthetic-fuel plants using coal is about $13,000 per barrel per day of capacity on a basis comparable with petroleum. From Fig. 1 it is evident that the capital costs of domestic petroleum production will not reach this level until some time beyond 1965-70.

There is still, however, the factor of the life of the productive capacity established by these capital outlays that must be considered. If it is assumed that average capital costs for new and replacement petroleum productive capacity have reached $10,000 per barrel per day, then over a 5-year period the amortization of these costs would amount to:

$$10{,}000 \times 0.7 \times 5/12 \text{ (for exploration and production)}$$

$$+ 10{,}000 \times 0.3 \times 5/20 = \$3{,}670 \text{ (for refining and distribution)}$$

For a synthetic-fuel plant costing $13,000 per barrel day of productive capacity and amortized over 20 years, the cost would amount to $13,000 × 5/20 = $3,260 over the 5 years.

On this basis of a longer life for the synthetic plant, it would seem, therefore, that the capital investment in a synthetic-fuel plant could be up to about $14,500 on an equivalent petroleum basis, or $16,000 per barrel per day on synthetic-fuel output, and still be equivalent to petroleum operations at $10,000 per barrel per day of capacity.

This indicates, so far as capital cost is concerned, that coal plants should become equivalent to petroleum some time after 1960.

Cost of Production

Estimates of the cost of production of gasoline from oil shale indicated in 1952 that it could be delivered on the Pacific Coast in the range from being competitive with petroleum products, to about 25 per cent higher. With sharply rising investment requirements for petroleum production in the United States, the differential in favor of petroleum will tend to disappear. In fact, oil from shale is very near a competitive position at this time.

It is also true that the shale industry has not been characterized by the massive research and development work that has been thrown into petroleum and substantial improvements in shale processing would result from such effort.

The cost of producing gasoline from coal has been estimated at from 15 to 100 per cent higher than the cost of producing it from petroleum. At the present time this puts coal in a less-favorable position than shale. In the writer's opinion, however, there are still areas where major modifications of both of the coal processes are possible that will further reduce capital and operating costs. These avenues are now worth substantial research effort.

In the coal plants the broad division between operating costs is about as follows:

	Per cent
Coal	24
Labor	21
Plant maintenance, depreciation, etc.	55

So far as raw material costs are concerned, there is an increasing spread between the cost of a million B.t.u.'s in the form of coal or oil. As shown in Fig. 2, 1 million B.t.u.'s in the form of Mid-Continent crude cost 67 per cent more than the average price of bituminous coal in 1946 and 180 per cent more in 1955. It will be seen from this figure that the average cost of coal has remained nearly the same or decreased slightly between 1948 and 1955.

This has resulted from numerous developments, including the use of new continuous mining machinery which has pushed production from an average of about 6 tons per man-day in 1946 to above 10 tons in 1955. If the initial synthetic-fuel plants were located on strip-mine coal, the costs should be well below the average values shown in Fig. 2. Eventually, however, the synthetic-fuel industry must depend on underground coal.

This increase in the cost of petroleum with respect to coal tends to enhance the competitive position of the synthetic-fuel plants, so far as raw materials are concerned.

Costs studies on synthetic fuels to date have been made on the basis of assuming a technically feasible process and calculating investment and operating costs. No attempt has yet been made to analyze each step in the operations and to apply the most modern American engineering practice to reduce the investment and operating costs.

Since the processes are complicated, this would require a great deal of time

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and effort, which is now justified by the increasingly favorable position for synthetic fuels so far as capital requirements are concerned.

Petroleum from Abroad

The free foreign world produced about 6,800,000 bbl. of oil per day in 1955 from reserves estimated at 148 billion barrels. Over the period 1950-55, from the capital requirements as given by Pogue and Hill,[1] it is estimated that the capital cost of a barrel of capacity per day was about $3,000. Exploration and production costs amounted to only 35 per cent of the total, compared to 70 per cent in the United States. These costs are expected to increase to 40 per cent by 1960-65.

These low costs, coupled with the very high ratio of reserves to production, indicate that the capital cost will increase only slowly over the next 10 years, reaching about $4,000 per barrel per day at the end of that time.

Shipping costs to this country are an important item, but it would appear that domestic petroleum will be in a steadily less-favorable competitive position for a number of years in the future. Free-world demand for oil is growing about twice as fast as in this country, and if this continues, undoubtedly foreign oil will ultimately become more expensive to find and produce.

Foreign oil, moving freely in international trade, will likewise tend to delay the advent of synthetic fuels in this country. It is evident, however, that economic considerations are not the only ones that should be weighed in the impact of foreign oil on domestic petroleum production, or on the development of a synthetic-fuel industry. It is obvious that this country must consider these factors in connection with its own security.

Regardless of the impact of foreign oil for the next one or two decades, the effect of world-wide demand for increased energy ultimately will force the use of all available carbonaceous reserves; and, because of the strong preference for liquid fuels, will likewise create an industry for the conversion of solid fuels to liquid fuels.

Reference

1. Future Growth and Financial Requirements of the World Petroleum Industry, Chase Manhattan Bank. Presented at A.I.M.M.E. meeting.

"How much oil will be found in the United States? Many qualified people have discussed this—in broad terms, their common conclusion is this: crude-oil production in the U. S. will reach its peak in the next 10 or 20 years, and then slowly decline thereafter."

. . . Oil shale and bituminous sand

by F. L. Hartley and C. S. Brinegar
Union Oil Co. of California

VAST oil-shape deposits occur in many sections of Brazil, but we have only very meager information as to their richness or extent. Ayres and Scarlott have placed Brazil's total recoverable shale-oil reserve at the enormous figure of 300 billion barrels. While other estimates are much more conservative, we can be sure that many billions of barrels of oil are available.

The most-extensive deposit, known as the Iraty black shale, is said to be at least 250 miles long, with a bed depth of from 100 to 300 ft. The Government of Brazil has sponsored research in oil shale retorting for several years. Since Brazil is an advancing nation that lacks adequate fuel supplies, we can be sure that they will continue to search for a means of utilizing this energy reserve.

The U. S. Geological Survey reports that oil shale has been found in Alaska and at least in half of the states. The two deposits of greatest significance are (1) the rich, and (2) the lower-grade (and geologically older) black shales occurring in several eastern states, known as the Chattanooga formation.

Since these black shales are usually found in thin seams yielding under 15 gal. per ton, they are not as yet counted in our oil-shale inventory. They do, however, represent a several-billion-barrel reserve for use sometime in the distant future.

Green River . . . It is the Green River formation that is of greatest economic importance. The portion of this deposit found in the northwest corner of Colorado, called the Piceance Creek basin, contains thick, rich oil-shale beds that can be mined from large, mechanized, underground mines. The latest geological studies, which we will discuss subsequently, place the total oil-shale deposit in this small basin at nearly 1 trillion barrels. It is here that the United States' oil-shale industry will ultimately develop.

. . . The Athabaska deposit in northern Alberta is the only one known that is large enough to be of really world-wide importance.

Estimates as to the deposit's areal extent vary from a few thousand to at least 30 thousand square miles. Outcrops are visible along the banks of the Athabaska River for over 100 miles. The accepted range of total oil reserve for the deposit (based on perhaps 300 core holes) is from 100 to 300 billion barrels, although Ayres and Scarlott mention an estimate as high as 500 billion.

But when we view the Athabaska deposit in terms of our three-fold classification of total reserve, total recoverable reserve, and total economic reserve we obtain a different picture. Unfortunately, by far the greatest part of this formation lies tilted beneath an overburden of 500 to 1,800 ft.

Taking the nature of the formation and the overburden into account, it seems unlikely that known underground mining methods could ever succeed in recovering this ore economically. Open-pit mining seems to be applicable only to those few places that have both a thin shelf of overburden and a thick layer of bitumen.

How much oil? . . . How much oil will be found in the United States? We are certainly not equipped to say. However, many eminently qualified people have discussed this subject in recent months, generally reaching about the same conclusion. A partial list of the forecasters would include Eugene Ayres, consultant for Gulf Research and Development; Joseph Pogue and Kenneth Hill of Chase Manhattan Bank; M. King Hubbert, consultant for Shell Development; Albert Nickerson, president of Socony-Mobil Oil Co.; and David Staples, president of Tidewater Oil Co.

In broad terms, their common conclusion is this: crude-oil production in the United States will reach its peak in the next 10 to 20 years, and then decline slowly thereafter.

If we accept this, it seems almost inevitable that energy costs must increase also, at least to the point where the most favorably situated bituminous sands and the richest oil shales can compete with the crude oil in the market place.

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time alone prevents production of either shale oil or bituminous sand oil before 1960. If current research efforts are successful, then from 1960 on the volume could expand rapidly as accumulating "know-how" pushes production costs down as competing energy costs continue to rise. Dr. Ayres, writing in the October 1956 Scientific American, has forecast shale oil production of more than 1,000,000 bbl. a day by 1975. Certainly there will be a ready market for this oil without disturbing the pattern of domestic production.

Shale-plant cost . . . Our studies indicate that a large complete oil-shale plant, including the necessary partial refining steps, will cost initially from $3,000 to $5,000 for each barrel of daily capacity. Thus, a 20,000 bbl.-a-day plant will cost between 60 and 100 million dollars; a 100,000 bbl.-a-day plant will cost in excess of 300 million dollars. Clearly, an oil-shale industry will be a big venture, requiring many companies, and many thousands of investors.

. . . Petroleum in developing world demand

by Austin Cadle
Standard Oil Co. of California

IN 1955, the free world consumed about 1 billion 200 million metric tons of coal, 10 trillion cubic feet of natural gas, and roughly 430 billion kw.-hr. of hydroelectric power. In addition, it consumed as fuels some 4 billion 500 million barrels of petroleum. The aggregate amounts to the equivalent of more than 13 billion barrels of oil or some 36 million barrels per day.

Studies indicate that, over a long period of years, world requirements have increased at an average rate of about 3.25 per cent annually, in spite of wars and depressions.

It seems reasonable to assume that requirements will continue to rise at an average of not less than 3.5 per cent per annum. Thus, the free world's total energy requirements would amount to more than 18 billion barrels oil fuel equivalent in 1965, and 26 billion in 1975. This is twice their present total.

Meeting requirements . . . The answer to how will these requirements be met cannot be found by studying only today's pattern of energy supplies, because the pattern is constantly changing, both in particular areas and in the free world as a whole.

In the United States, for example, coal provided 65 per cent of our energy in 1929. It now accounts for less than 30 per cent and use of oil and natural gas has increased sharply. Oil now provides about 40 per cent of our energy, while the two together provide two-thirds of the total.

In free Europe, coal supplied almost 90 per cent of energy needs in 1929 and 70 per cent in 1955, while the position of liquid fuels rose from 4 to 17 per cent and natural gas has become a small but measurable factor.

Until the second World War, free Europe was an exporter of fuel to other parts of the world but it now imports more than a fifth of its energy.

From 1950 to 1955 some 77 per cent of the growth in free-world energy needs was met—directly or indirectly—by oil and gas, 53 per cent by oil alone. Water power provided 15 per cent, coal only 10 per cent.

Future growth . . . Were it to be assumed that liquid fuels over the next 20 years will supply about the same proportion of the increase in free-world energy needs as in the recent past, the indicated expansion in required petroleum supplies amounts to an arresting total.

From our studies it is concluded that this is an entirely acceptable assumption, even after allowing for any reasonable contribution from new sources of energy. It indicates that the free world's requirements for liquid fuels should rise from about 13 million barrels per day last year to something over 32 million barrels daily in 1975. Total petroleum requirements, including those in nonenergy uses together with losses, should amount to about 36 million barrels per day.

Will the international petroleum industry be able to meet the free world's greatly increasing demands as the next two decades unfold?

Assuming a continuation of political and economic conditions favorable to continued expansion of exploration and development throughout most of the free world, I am firmly convinced that ample supplies of petroleum will be available.

It seems evident, even in the United States, that possibilities for new discoveries are by no means exhausted. There are still highly favorable petroleum provinces in our land area that have not been fully explored.

Improved technology is progressing continuously in the spheres of geology, geophysics, and drilling. Very encouraging strides are being made in secondary-recovery methods.

We all think in terms of our own country's position, and that of the Middle East, Venezuela, and Canada. While not wanting to minimize the present size or future potential of reserves in these areas, I would observe that only 5 to 8 per cent of the entire free world's reserves have been assigned by most estimators to regions outside these areas.

The industry is beginning to realize this fact. Vast new and still unproved foreign petroleum provinces are being leased in many countries that have either no commercial production to date or relatively small production.

While my remarks pertaining to petroleum have been directed primarily to the next 20 years, I am also firmly convinced that at some future time new forms of energy will have developed to the point that they will be able to assume their rightful role in furthering the progress of mankind.

. . . Production of atomic energy

by L. M. Currie
Union Carbide Nuclear Co.

URANIUM, primarily U-235, is our basic, natural atomic fuel. It is our real starting point. In large atomic piles, such as at Hanford or Savanna River, U-238 is converted to Pu-239, a fissile material of maximum importance in weapons technology, but—as yet—of unproved value in civilian applications.

We cannot imagine economic power being generated indefinitely by the burning of U-235 alone. An American nuclear power industry—as large as our present electrical power business—and based entirely on U-235-238—would burn annually about 70,000 kg. of U-235 and produce about 30,000 kg. of plutonium-239 as a byproduct. We sincerely hope that this much Pu will not be needed for weapons: so some civilian use must be found.

Uranium mining . . . There was no real uranium mining industry as such in the

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United States in 1946. Our multibillion-dollar installations for atomic weapons was then largely dependent upon two mines—one in the Belgian Congo and one in northern Canada.

In 1948, 70,000 tons of uranium ore were mined in the United States. About 3,000,000 tons were mined in 1956: possibly 6,000,000 tons by 1958. According to the June, 1956, AEC Report on Major Activities, the production by the free world of uranium oxide (in commercial concentrates) should soon reach 30,000 tons annually.

The first atomic pile — Fermi's CP-1—was a primitive affair. It first operated just about exactly 14 years ago (December 1942). The progress of the atomic energy program (MED) was largely a military operation until well into 1947 when civilian applications first received major consideration.

In 1951 private industry was invited to "come in and have a look" at possibilities of nuclear power. In a short time, more than 80 industrial firms were spending their own money on study teams, etc.

And now—in just a little more than 2 years—American industry is planning to produce about 700 megawatts (mw.) (electricity)—all privately financed—at a total cost that will probably exceed a quarter of a billion dollars. In addition, industry will join with the AEC in a Power Demonstration Program for 400 mw., and the AEC's own experimental Power Reactor Program has been stepped up from five types to about nine.

By 1962, these plants will be producing power (for civilian uses) more than equivalent to current output of all the power plants in Colorado.

Since 1942, the United States (largely AEC) has built and operated more than 80 reactors, and privately built and owned power reactors are just getting under way! Truly AEC's progress since 1947—and industry's progress since 1954—has been one of the "new" wonders of the world!

Electric power costs . . . Costs of electric power to the ultimate consumer may be considered as being made up of three principal components. Based on United States national averages for 1955, the actual values are:

	Mils per kw.-hr.	Per cent
(a) Generation	6.8	42
(b) Transmission and distribution	8.2	50
(c) Miscellaneous	1.3	8
	16.3	100

If we confine our current thinking to the area of power generation we may break the 6.8 mils down to:

		Per cent	
(d) Fixed charges for plant	3.7	54	23
(e) Operation and maintenance	0.5	7	3
(f) Fuel costs	2.6	39	16
	6.8	100	(42)

Compared with these figures for costs of power from conventional (fossil fuels), we should be reminded that nuclear-powered plants will — for some years to come — cost more. The sodium-graphite reactor may not be typical but (initially) it is estimated to cost:

	Dollars per installed kw.
Atomic part	165
Sodium exchanger, etc.	55
Electrical part	120
	$340

Conventional plant cost . . . Similar conventional plants cost probably $120-$180 per kilowatt. But even with this handicap Atomics International estimates that atomic power can be generated at a cost of 11 mils per kw-hr.—if you allow 2.9 mils as credit for the plutonium produced. With an estimated equal allowance, the British at Calder Hall, etc., expect to produce power at 7-8 mils. This is economic (commercial) in U.K.

G.E. experts (Falls-Rakemeyer) predict that atomic-powered plants will compete costwise with conventional central power stations in many sections of the United States by 1980. Other experts are even more optimistic. But practically all qualified experts predict that nuclear-powered plants — though perhaps not quite competitive — will (long before 1980) be producing a large share of the world's requirements for electric power—and supplementing and conserving fossil fuels.

The amount of electricity generated from nuclear processes could be greater than the total generating capability of the United States in 1955.

The British estimate that—by 1970—their electric power from nuclear plants will equal present output from British coal.

. . . Nuclear energy's price tag

by E. E. Burlingame
Arthur D. Little, Inc.

THE financial question is a vital aspect of the nuclear industry. Most of the money spent to date on nuclear research and installations has come from Government sources. In the past 16 years, the Government has spent over $15 billion on nuclear research, not including $1.7 billion being spent in the current fiscal year. Private funds made available in the same period probably amounted to no more than $125-130 million.

In most recent periods private expenditures are estimated at an annual rate of about $75 million. If industry is to participate to the fullest extent in future nuclear activities, it is estimated that some $500 million of private funds must be spent annually beginning around 1965.

One of the most important uses of atomic reactor heat will be for the production of electric energy. The electric utility industry in the United States has a present annual capacity of about 120 million kilowatts. Our projections indicate a rated capacity of some 600 million kilowatts by 1980. Of this total, close to 100 million will be nuclear-based power. This will constitute about 15 per cent of 1980 capacity and will represent a capital investment of some $25 billion.

By 1980, some 60 per cent of all annual capacity additions will be nuclear and 40 per cent will be conventional. It is clear then, that the advent of competitive nuclear-power facilities will not disrupt the electric-utility industry, but will instead provide the industry with a highly necessary supplementary source of power. Even in 1980, by which time we expect that nuclear power costs will be fully as low as conventional power costs, some 40 per cent of capacity additions will be of the conventional variety.

Moreover, it is important to note that we expect some 375 million kilowatts of conventional capacity, or more than triple present rated capacity, to be added during the next 30 years. Therefore, it is obvious that the advent of nuclear power has not impaired the outlook for industries which are tied closely to the conventional electric-power utility field. For example, the coal industry in 1980 will have to supply more coal to electric utilities than was consumed for all purposes in 1955—employing a growth factor of four or five times.

Direct Heat

The other major potential use of the heat from an atomic reactor is as direct heat, either for industrial processing or for space heating. The market for heat in industrial manufacture is even larger than the industrial mar-

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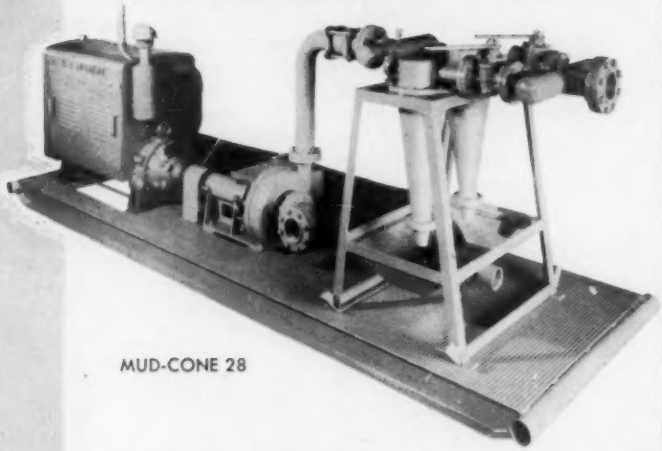

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Tomorrow's energy

Starts on page 120

ket for electric power. Very little attention has yet been paid to the possible use of atomic reactors for process heat, but some preliminary studies on the problems are now under way.

At present, atomic heat offers no economic advantage over heat derived from conventional fuels. However, the demand for process heat in the United States is expected to triple in the next 25 years, and it seems highly likely that a considerable amount of this heat will be attained through atomic reactors.

It is more difficult to make an optimistic forecast of the prospects of space heating. At Harwell, England, they have used waste heat from their research reactor to provide heating for adjacent buildings since 1948. Some similar applications have been made at Hanford, Wash.

However, there are real problems which prevent the use of atomic energy for space heating. Because of the heat loss involved in transporting heat over distances, atomic reactors could be used only in very heavy metropolitan areas, and even here, their advantages are questionable. A small reactor for individual space heating would, in all likelihood, be far too expensive to justify its use.

Radiation . . . Along with heat, the nuclear reactor also supplies radiation products. Radiation is employed in three broad areas: biological, chemical, and industrial. A considerable use is already being made of the radioactive isotopes which are byproducts of present experimental nuclear reactors.

The primary United States source of radioisotopes in bulk, the Oak Ridge National Laboratory at Oak Ridge, recently completed its tenth year of processing and distributing radioactive isotopes. The laboratory now supplies 2,700 users throughout the United States and 57 foreign countries. The products are supplied to the many commercial firms which purchase radioisotopes in bulk and reprocess them into such forms as labeled compounds, certified pharmaceuticals, and custom-manufactured radiation devices.

Radioisotopes and radiation already are being used by industry for process control and inspection and for research. Some $1 million worth of radioisotopes are now being sold annually to industry permitting annual savings of an estimated $100 to $200 million. These savings are secured through improved knowledge of materials, thickness, accurate measurements of radiographic inspection, and other ways. By 1965 annual savings through these devices will be $1 billion.

No Noxious Ammonia Odors Here

Air-pollution control pays off for Phillips in better-mannered plant, and a $15,000 saving in fuel bill

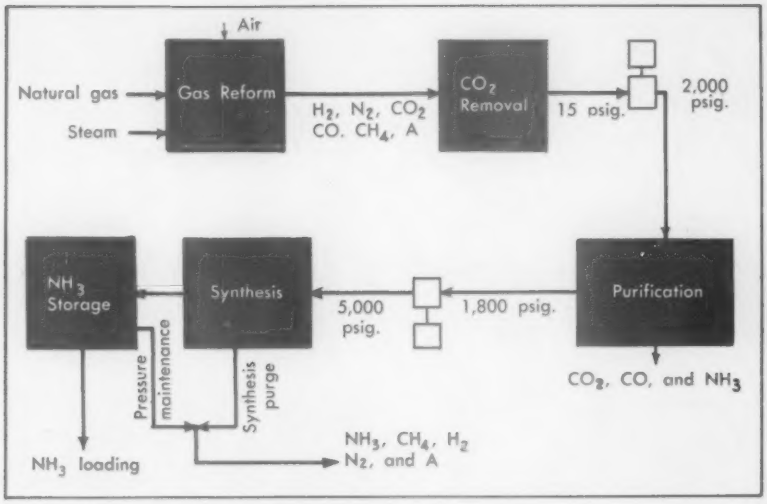
by W. E. Burns and R. R. McMullan

AT Phillips Chemical Co.'s ammonia plant located on the Houston Ship Channel in Pasadena, Tex., a determined effort is made to eliminate the release of ammonia vapors and other objectionable materials. To this end the company cooperates with municipal, county, and state health agencies to the fullest extent.

The Process

This plant was designed to produce 450 tons per day of anhydrous ammonia from air and natural gas. A simplified flow diagram is shown on Fig. 1. Briefly, the process consists first of a gas-reforming section that converts natural gas and steam to hydrogen and carbon oxides. Sufficient air is introduced to provide the three-to-one ratio of hydrogen to nitrogen required. Most of the carbon dioxide is removed by the standard amine absorption process. Then the process gas, consisting of nitrogen, hydrogen, residual carbon dioxide, carbon monoxide, argon, and unreacted methane is compressed to about 2,000 psi. At this pressure the residual carbon dioxide and carbon monoxide are absorbed in an ammoniacal solution of copper formate, commonly called "copper liquor." After the removal of these impurities, the process gas is compressed to 5,000 psi. and catalytically reacted in the synthesis section to produce ammonia.

Authors are with Phillips Chemical Co., Houston. Paper presented at Air Pollution Control Association Meeting, Houston. Entire program will appear in A.P.C.A. proceedings.



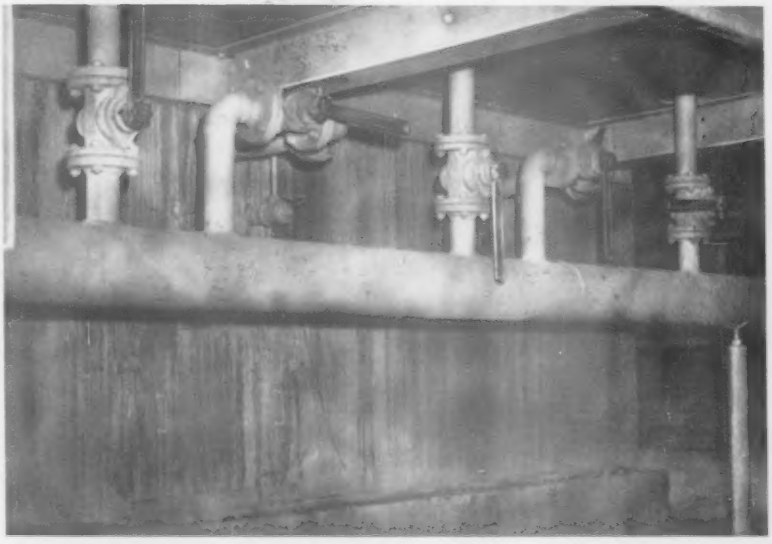
SIMPLIFIED ammonia plant flow diagram. Fig. 1.

Possible Pollution Sources

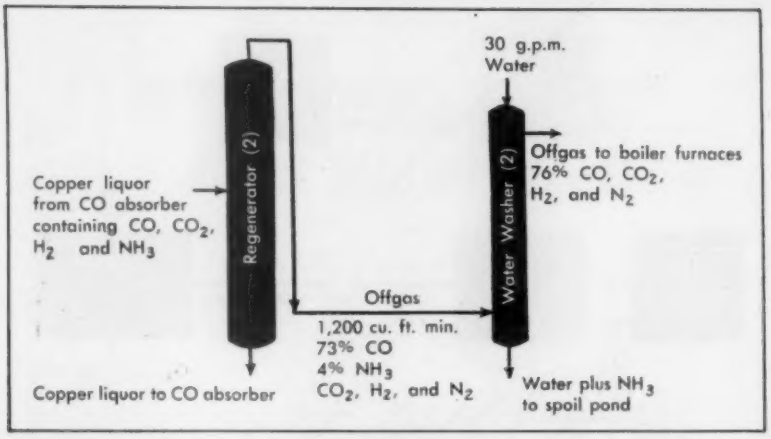
In this process there are two potential sources of air pollution. The first is the offgas from the regenerator which removes the carbon monoxide from the copper liquor. This gas stream also contains significant quantities of ammonia stripped from the ammoniacal copper liquor. The second potential source of air pollution is the purge of gas from the converters in the synthesis section of the plant and the vapors from the ammonia storage tanks and spheres.

Regenerator Offgas

First, let us consider the offgas from the copper liquor regenerator as a source of air pollution. At normal production rates, this stream of about 1,200 s.c.f.m. contains 73 per cent carbon monoxide, 4 per cent ammonia, and some carbon dioxide, hydrogen, and nitrogen. The large volume and poisonous nature of this gas make it



THE BOILER FURNACES where the offgas is burned as fuel, showing the header and lines to the individual ring-type burners. Fig. 2.



SIMPLIFIED FLOW DIAGRAM showing water-washing of the offgas from copper liquor regenerator. Fig. 3.

undesirable to vent it to the atmosphere.

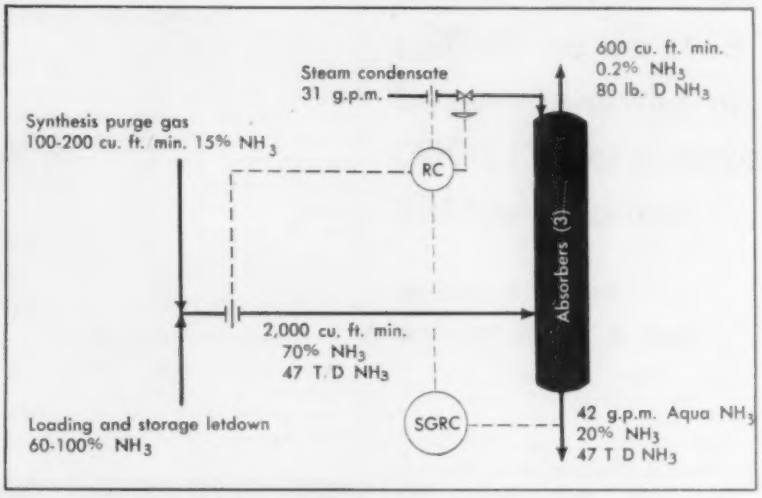
To flare the gas in the process area is not feasible because of the potential fire hazard. This disposal problem was solved by piping the gas to the boiler furnaces, where it is burned as supplementary fuel (Fig. 2). Burners of the ring type are used to inject the offgas into the air stream at each main fuel gas burner. However, the ammonia must be removed from the gas prior to burning since corrosive nitrogen oxides would be formed from the combustion of the ammonia. Therefore, the gas is fed to two water washers, each a 4-ft.-diameter by 24-ft.-high packed column, where the ammonia in the offgas is absorbed in water (Fig. 3).

The water washer removes essentially all of the ammonia contained in the offgas (Fig. 4). The ammoniated water is sent to a spoil pond where it is adequately neutralized by acidic wastes from another plant located at Adams terminal before it is allowed to flow into the ship channel.

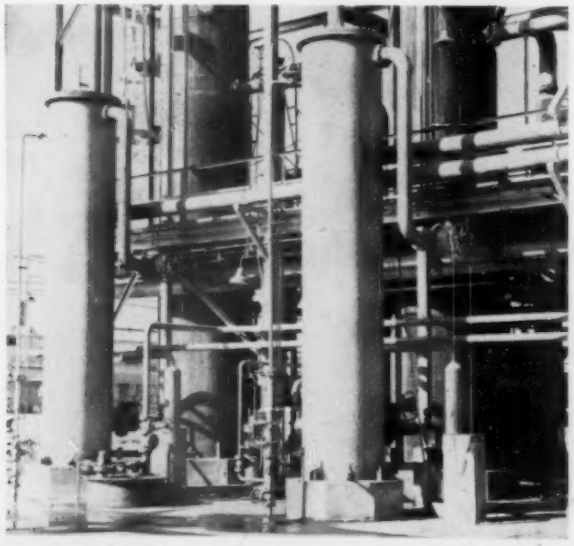
This simple system is completely satisfactory. A safety hazard is eliminated, pollution of the air is avoided, and about $15,000 per year in boiler furnace fuel is saved by burning the offgas stream.

Purge Gas

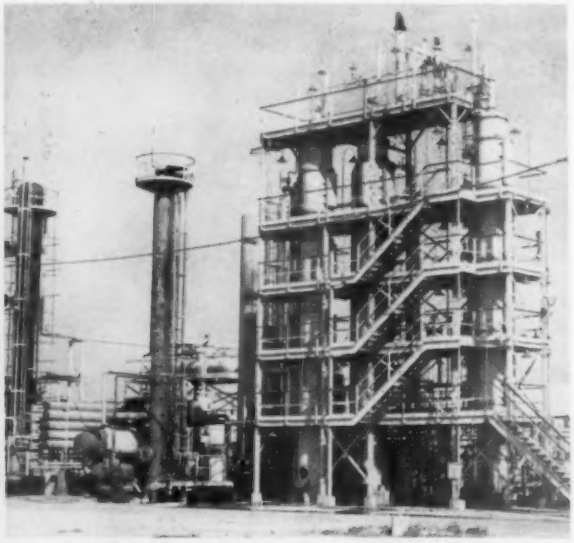
The synthesis-section purge gas and the storage tank and sphere pressure-maintenance system is also considered as a source of potential air pollution. In order to prevent the buildup of methane and argon in the synthesis cycle, it is necessary to vent about



SIMPLIFIED ammonia absorber flow diagram. Fig. 5.



IN FOREGROUND are water washers where ammonia vapor in offgas is absorbed in water prior to burning offgas in boiler furnaces. Fig. 4.



THE THREE COLUMNS on the right are the absorbers used to recover ammonia from the synthesis purge gas and storage pressure maintenance system. Fig. 6.

100 to 200 std. cu. ft. per minute of synthesis cycle gas from the system. This gas is about 15 per cent ammonia.

To prevent pressure buildup in the anhydrous ammonia storage tanks and spheres, it is also necessary to let down gas from these vessels to a lower pressure. Vapors from the storage vessels vary from 60 to 100 per cent ammonia. During loading operations, tank cars and trucks are vented into the pressure-maintenance system. The purge gas and the let-down vapors are collected in a common header and the combined mixture is about 70 per cent ammonia.

The combined flow to the header of 70 per cent ammonia vapor is about 2,000 std. cu. ft. per minute which amounts to about 47 tons per day of ammonia. Economics alone would prohibit venting such a large quantity of ammonia to the atmosphere.

Ammonia absorber . . . To recover the ammonia, this stream is fed to three absorbers, as shown in Fig. 5, where the ammonia is absorbed in a total of about 31 g.p.m. of steam condensate. The remaining gas, consisting of methane, hydrogen, nitrogen, argon, and only a trace of ammonia, is vented to the atmosphere. Less than 100 lb. of ammonia per day is lost in this way. The flow of condensate to the absorbers is regulated on ratio control by the quantity of gas being fed to the absorbers. Because the ammonia content of the gas feed constantly changes, the ratio controller is reset by a specific-gravity controller on the bottoms product to compensate for these changes.

About 42 g.p.m. of 20 per cent aqua ammonia is recovered from the absorbers as bottoms product. This aqua ammonia is stored or the anhydrous ammonia is recovered from the aqua by fractionation. Fig. 6 shows the absorber system including three bubble-cap towers which are 42 in. in diameter and 36 ft. high.

The cost of the entire system, including water-cooled tube sections, pumps, instruments, and piping, is considerably in excess of $150,000.

The equipment for treating these two potential sources of air pollution was specifically installed to prevent air pollution and economic losses. Except for possible, but very infrequent operational upsets, there has been no pollution of the atmosphere from these sources and we have received no complaints.

By eliminating these potential sources of pollution and material losses, the company has fulfilled an obligation to its employes, the general public and its stockholders. **End.**

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BUILDS PUMPS THAT BUILD GOOD WILL

Gas Wells Also Respond to Fracturing

New techniques applied to gassers in Fort Smith-Spiro area. Results? A highly successful stimulation method.

by H. E. David

Here's a rundown on different treatments

Success of fracturing treatments depends on choosing proper fracturing fluid. Here are current recommendations in capsule form.

Acid-oil emulsions	**Used in limestone formations, sand formations with proper composition that are 20 per cent soluble in 15 per cent hydrochloric acid.**
Thickened water	**Used in dry gas wells in clean sands that have little or no solubility in hydrochloric acid and contain no bentonite.**
Thickened oil	**Used when acid-oil emulsion or thickened water are not specifically indicated, most universally acceptable fracturing fluid for gas wells, used when in doubt.**
Refined oil	**Used only when high pressures keep injection rates low.**

DURING the past year, fracturing treatments for gas wells have "come of age." Results obtained during this period indicate that substantial production increases may be obtained in nearly every case by correct application of this type of treatment to a gas well. Recommendations and conclusions given here apply primarily to the Fort Smith-Spiro area of western Arkansas and eastern Oklahoma, but they may also be of value in other gas-producing areas.

Since the advent of fracturing, continued attempts have been made to apply such treatment to gas wells. Early results were not encouraging. In some wells profitable increases were noted, but in the majority of wells treated, either no increase was obtained, or production actually decreased indicating permanent damage to the producing zone.

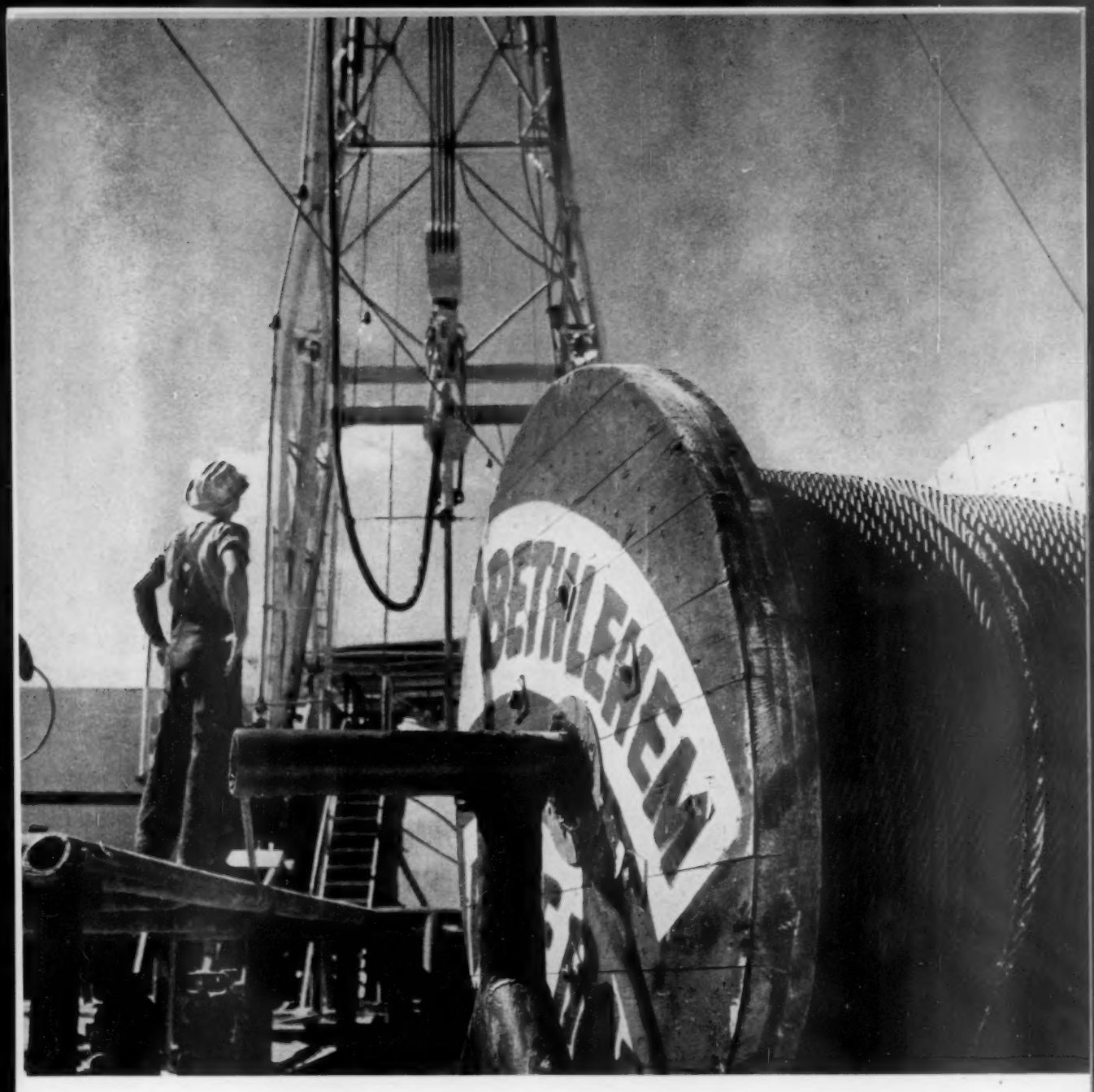
During the past year, however, work done in some of the major gas-producing areas has indicated that profitable results may be obtained in an extremely high percentage of wells treated, provided a careful study is made of sand conditions and problems, and thought is given to the selection of the proper materials, methods, and equipment.

A gas well may be defined as a well which produces natural gas as the main commercial product. A gas-distillate-producing well, however, is classified as a gas well because the distillate is an auxiliary product.

Author is with Dowell Incorporated, Cushing, Okla.

PRODUCING

Two types . . . For the purpose of discussing fracturing treatments, gas wells may be classified into two groups: (1) those producing dry gas, and (2) those producing wet gas. **Dry-gas wells** are those in which the natural gas produced consists chiefly of methane. Although the gas in such wells generally contains small percentages of ethane and some of the heavier hydrocarbons, these percentages are so slight that there is no condensation of liquid hydrocarbons in the gathering system. In fact, the heavier hydrocarbon content is so slight that generally it is neither profitable nor



Wire Rope at Work—Far out on the rolling West Texas prairie, the contractor was putting down a wildcat well when this photograph was taken. Drilling at that time was in the Ellenburger formation; it had already passed 7200 ft, and the plans called for going another 300.

The rig was equipped with a jackknife mast and approximately 3500 ft of 1⅛-in. 6x19 rotary line. This stout wire rope was Purple Strand Form-Set, Bethlehem's top-grade preformed. Like all Bethlehem rotary lines, it handled the heavy strings of drill pipe with no fuss or strain, meeting every demand of the job with plenty to spare.

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economical to process the gas in a gasoline plant.

Wet-gas wells are those in which the natural gas produced contains a relatively high percentage of heavier hydrocarbons, such as propane, butane, and pentane. Frequently these percentages are so high that condensation of liquid hydrocarbons occurs and separators or scrubbers are required at the surface. Since gas-distillate wells produce some liquid hydrocarbons, they will be considered as wet-gas wells for the purpose of this discussion.

Treatments for dry-gas and wet-gas wells generally differ only in the fracturing fluid employed. Because the success of the treatment is largely dependent upon the use of the correct fluid, **properly classifying a well into one of these two groups before choosing the fracturing fluid is vital.**

Fracturing Fluids

Although techniques and materials vary widely, the purpose of nearly all oil or gas-well treatments is to increase production by increasing the permeability of the producing section. In fracturing treatments, this is accomplished by establishing a split, or fracture, which extends from a well bore outward into the sand body.

In fracturing treatment, the splitting or fracturing is accomplished by driving a hydraulic wedge into the sand body. Sand is suspended in a fracturing fluid. When the fluid is withdrawn, the sand remains to prop open the fracture, which would otherwise be closed by the pressure of the overburden.

The primary difference between various types of fracturing treatments is in the fracturing fluid used. The fluids which have been used successfully in gas-well treatments are refined oil, thickened crude oil, acid-oil emulsions, thickened water, and untreated water.

Refined oils . . . Refined oil is not recommended for use in fracturing treatments of gas wells, except as a last resort in those cases where pressures are high and injection rates, consequently, are so low that less-viscous fluids will not carry sand well enough to prevent screenouts.

Sandfrac uses a refined oil, primarily in treatments of oil wells. This is a low-gravity oil with fairly high viscosity. It is an excellent sand-carrying fluid. Due to the relatively high viscosity and low volatility of refined oil, it generally remains in the fine pores of the formation around the fracture, both near the well bore, and further into the formation where differential pressures are low.

Gas, being less viscous than the green oil, will bypass the oil as it enters the well bore, and the oil will remain, permanently blocking many formation pores. Although the improved drainage caused by the fracture sometimes more than offsets this detrimental effect, cleanup time of the well is extended, and the wells often produce a spray of green oil for months or even years, after the well is placed on production.

While the above phenomenon occurs with all fracturing fluids, the detrimental effects are not as pronounced with the less-viscous fluids and better increases are obtained by using them. Also, when less-viscous fluids are used, cleanup time is shortened. In most cases, 95 per cent of the fluid used has been returned to the surface within the first few days following treatment.

Thickened oils . . . Thickened oils are probably the most universally acceptable fracturing fluids for use in gas wells. They have been used with good success in practically all types of producing formations, except limestone. Perhaps the one situation in which they would not be recommended is in gas wells which produce large amounts of water. Here, emulsions might occur which would be troublesome in getting the well on production.

Petrojel* uses crude oil, kerosine, diesel oil, or high-gravity distillates, thickened by the addition of soap solutions to provide improved sand-carrying characteristics. For use in gas wells, thickened kerosine, diesel, or distillate fracturing fluids are more suitable than thickened crude oil.

The apparent viscosity of thickened oils is controlled by the amount of soap added. It is only necessary to thicken these fluids enough to carry sand at the anticipated injection rate. Surprisingly enough, thickened oils have both lower friction loss during pumping and better sand-carrying qualities than refined oils.

Acid-oil emulsions . . . Acid-oil emulsions have been the most effective of all fracturing fluids in increasing production in gas wells. They are recommended without reservation in limestone formations. In sandy limes and limy sands, however, their economic limit is reached in formations with low solubilities of about 18 to 20 per cent. While they have obtained good increases in formations of low solubility, equally good results may be obtained with less expensive fluids. Therefore the additional cost of acid-oil emulsion is not justified.

In sandstone formation with calcareous materials or calcite-filled fractures, these emulsions are applicable. However, in sand formations where clean sand grains are cemented with only small amounts of dolomitic or calcareous materials, it is easy to disintegrate the formation with strong acid solutions. Therefore as the lower limits of solubility are approached, the concentration of the acid should be reduced. At a solubility of 20 per cent, acid concentrations of 10 per cent hydrochloric acid are sufficient, while at lower solubilities, acid concentrations of 5 to 7½ per cent hydrochloric acid should be used.

Acid Petrofrac uses an acid-in-oil emulsion as a sand-carrying medium. Thus it both acidizes and fractures in one operation. As used in eastern Oklahoma and western Arkansas, this emulsion consists of 95 per cent hydrochloric acid and 5 per cent kerosine, by volume. The concentration of the acid can be varied to fit given well conditions but generally ranges from 5 to 15 per cent.

Although the acid-oil emulsion is a high-viscosity material, it breaks down when the acid is spent, or when the material is forced through the formation's pore. It has the advantage of being a viscous, sand-carrying medium which thins to a comparatively low-viscosity fluid and returns to the well bore readily after the treatment.

Thickened water . . . A thickened-water fluid is applicable to wells producing dry gas. It cannot be used safely in wells producing wet gas because emulsions or hydrates are likely to occur, thus causing difficult production problems. This fluid may be used safely in any clean sand formation (dry gas) which does not contain bentonite or more than a few minute shale streaks.

Some of the greatest advantages of thickened water as a fracturing fluid are availability of materials, cost of treatment, and relative ease of handling. In most gas-producing areas, diesel oil or kerosine is not readily available, and must be hauled long distances if thickened oils are to be used. Mixing tanks for gelling the oil must be set at the location. Another problem is that of disposing of the oil following the treatment.

With thickened water, only water must be obtained, and this generally is available close by. The water may be gelled in tank trucks or in small auxiliary pits dug at the location for this purpose. Upon completion of the treatment, it is easy to dispose of the water. It may be returned to the pits or pumped out on the ground. From the cost standpoint, thickened water is a little less than half as expensive as thickened oil.

Waterfrac uses a fracturing fluid formed by the addition of a gum material to water to give it added viscosity and improved sand-carrying characteristics. Because the gum material

*Service mark of Dowell Incorporated.

used is destroyed by bacteria, the thickened water returns to a low viscosity within a formation.

This transformation is rapid in acid solutions, but may require several hours or even days in water solutions, depending on bottom-hole temperature. (In most of the wells in western Arkansas where Waterfrac has been employed, the gel had not completely broken at the end of 36 to 48 hours, even though most of the material had been returned to the surface during that time).

Thickened water, like thickened oil, can be gelled to the viscosity required for existing well conditions. Also, it returns readily to the well bore upon completion of the treatment.

Unthickened fresh water . . . Unthickened water is applicable to the same types of formations as thickened water and enjoys many of the same advantages. However, it has one limitation not imposed on thickened water. Its critical velocity or necessary injection rate has been determined to be 5 bbl. per minute down 2-in. tubing, or 30 bbl. per minute down 5-in. casing. At lower injection rates, it will not support sand, and screenouts will occur. At these injection rates and above, no trouble has been encountered as a general rule.

Riverfrac* is a fracturing treatment employing unthickened fresh water as the sand-carrying agent. It was developed and has been used in the San Juan basin with good results, and is now being used widely in the United States and Canada.

Selecting the Correct Fluid

From the foregoing discussion, it is readily apparent that the characteristics of the producing zone determine which fracturing fluid should be used, while well conditions determine the proper treating technique. When a gas well is to be treated, all available information should be gathered and studied.

The first decision to be reached is whether the well is to be classed as a producer of wet or dry gas. In the case of a wet-gas well, the use of a thickened oil fracturing fluid is preferable. In extreme cases, as previously discussed, refined oil may be used.

If the well is to be a producer of dry gas, then a careful study should be made of well cuttings, cores, and previous experience in the area. Solubility and sand structure are the first considerations. If these warrant, an acid-oil emulsion should be used. The concentration of the acid is determined both by structure and degree of solubility, as discussed earlier.

Considering water . . . Should an acid-oil emulsion not be applicable, the next fracturing fluid to be considered is water. Whether or not the water is to be gelled depends on well conditions, and will be discussed later. If the sand formation is clean and solubility is slight, thickened water may be used.

A sand may be considered clean if it contains only minute shale streaks and no harmful silicates. Silicates are composed of silicon, oxygen, and one or more metals such as aluminum or iron. Their characteristic swelling when contacted by water is extremely detrimental to oil and gas-well production. This swelling apparently is more pronounced when the silicates are wet by spent acid and brine than when wet with fresh water. Such swelling has been a serious problem in some acidizing treatments.

Formations . . . Gas sands containing as high as 65 per cent silicates have been treated successfully with thickened water without detrimental effects. Reasons for this apparent contradiction are not known. There is, however, one silicate, bentonite, a member of the montmorillonite group, whose presence in sand precludes the use of water.

To date, only one sand containing bentonite has been encountered in eastern Oklahoma. This is the Gilcrease formation, a sand of the Atoka series. Laboratory tests have shown that this particular sand will increase 13 per cent or more in volume when wet with water or spent acid. Even excellent silicate control agents have been ineffective in preventing this swelling.

Although the majority of sands treated in other wells in eastern Oklahoma and Arkansas are also Atoka series sands, they have presented no swelling problem. Therefore, unless a sand contains large quantities of shale, extraneous materials, or bentonite, thickened water may be used.

Should a producing zone not display favorable characteristics for the use of an acid-oil emulsion or thickened water, a thickened kerosine, diesel, or distillate should be used. As previously pointed out, high-gravity, thickened oils are the most universally acceptable fracturing fluids for gas-well treatments. Almost without exception, they may be used safely and successfully in any type of gas-producing zone.

As discussed earlier, refined oil has not been generally successful in gas-well treatments, and it should be used only as a last resort.

Sand concentrations . . . In gas-well fracturing, sand concentrations have been varied in the case of all fracturing fluids in order to determine the most effective concentration. They have ranged from ½ to 3½ lb. per gal. In all cases in which concentrations of 3 lb. per gal. were exceeded, screenouts occurred.

"The size of sand grains is also of interest in gas-well fracture treating. A round-grained 20-40 mesh sand has been adopted as the standard for most treatments in this area."

When the concentration was greater than 2 lb. per gal., extreme sand problems resulted, even when all the sand was successfully displaced into the formation. Enough sand was produced along with the gas in these instances to completely cut out surface and wellhead equipment within a few hours. In cases where sand concentration was 2 lb. per gal. or less, screenouts were not excessive and no sand problems were encountered.

Purely from an experience standpoint, therefore, the following sand concentrations are recommended:

1. Limestone reservoirs. Use an acid-oil emulsion with 1 lb. of sand per gal.
2. Sand reservoirs. Use suitable fracturing fluid. Start sand at a low concentration (½ lb. per gal.) and gradually increase at 2 lb. per gal. Maintain this concentration for remainder of treatment.

The size of sand grains is also of interest in gas-well fracture treating. In eastern Oklahoma and western Arkansas, pressures have prohibited the use of anything larger than a 20-40 mesh sand. On the other hand, some producing zones have required use of a smaller grain-size sand. A round-grained, 20-40 mesh sand has been adopted as the standard for most treatments in this area.

Use of mud acid . . . Most gas-producing zones are porous and susceptible to invasion by drilling fluid during rotary drilling. Porosity conditions may vary considerably over a single sand section, and, as a general rule, the more porous sections are the most prolific producing sections in a given zone. These sections are also deeply penetrated by drilling fluids.

Because the most highly invaded sections offer the greatest resistance to fracturing, it is probable that, unless the drilling fluid is removed before the treatment, fractures will be established in less desirable sections. Such fluid can be removed by mud acid.

Mud acid may be used as a spearhead for the fracturing treatment or as a separate treatment prior to fracturing. Although both methods have been highly successful, the latter is prefer-

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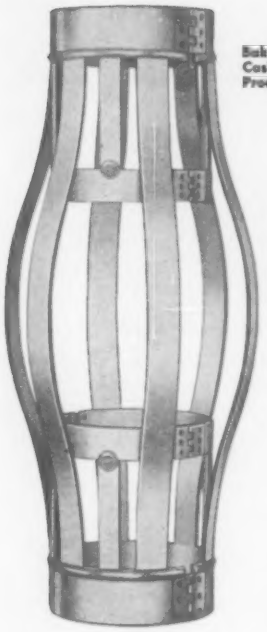

Baker Model "H-20"
Casing Centralizer
Product No. 9112

a size and type...

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(3" Bowed Height)
Product No. 9114

Model "H-25"
(2½" Bowed Height)
Product No. 9113

Model "H-15"
(1½" Bowed Height)
Product No. 9115

Model "H-20"
(2" Bowed Height)
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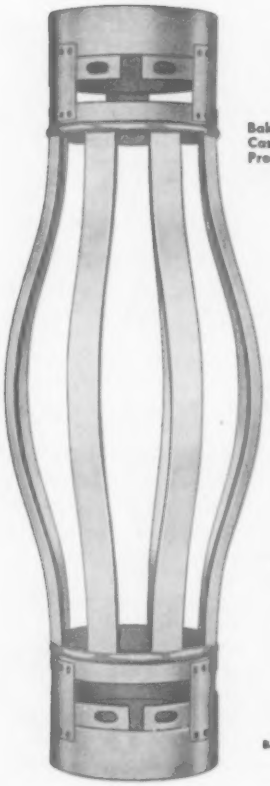
"TAILORED" to your needs because Baker Casing Centralizers are made with bowed height ("effective reach") of springs from 1¼" to 5"—for a range of open hole diameters from 5⅜" to 26½"—and to run on casing sizes from 4½" to 16". It's easy to see that the *exact* size is available to fit *your* casing and provide effective centering in the greatest practical range of open hole diameters.

"tailored" to your needs...



Baker Model "G-20"
Casing Centralizer
Product No. 910-G

Model "G-20"
(2" Bowed Height)
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Model "G-15"
(1½" Bowed Height)
Product No. 910-G

Model "G-12"
(1¼" Bowed Height)
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"TAILORED" to your wishes, and you can choose between the Baker Model "H" HINGE-LOK Centralizer which is closed and locked around the casing coupling or stop ring—or you may prefer the Baker Model "G" SLIP-ON Centralizer which is merely slipped over the casing and positioned with stop rings.
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able. It not only allows removal of the drilling fluid from the well, but furnishes an indication of treating pressures to be encountered. This is of great benefit in determining the treating technique to be employed.

How to use it . . . When mud acid is used, it should be spotted across the entire producing zone and allowed to stand a few minutes. The formation should then be broken down and the mud acid injected at a relatively slow rate about 1 to 1½ bbl. per minute.

If the acid is used as a spearhead, the fracturing treatment may then be started. If it is used as a separate treatment, it should be displaced into the formation and allowed to stand for a period of 15 to 30 minutes. It should then be flowed or swabbed back as rapidly as possible. In this case, fracturing may be started as soon as the well appears to be clean of all fluids.

The amount of mud acid used should be relatively small, 100 to 500 gal. A rule-of-thumb method of determining the amount of acid needed is to use 100 gal. of mud acid for each 10 ft., or fraction thereof, of producing formation.

Recently there has been a trend toward air drilling in many gas-producing areas. Even air or exhaust gas is used as a drilling fluid, the well is usually mudded up when drilling is completed in order to facilitate the running of electric logs and casing. Mud acid should be used in these instances.

L.P.G. spearheads . . . Propane and butane have been used frequently as spearheads in fracturing oil wells, and in some instances their use has been applied to fracturing gas wells. The reason for using these materials is twofold. They are excellent solvents for oil-base fracturing fluids, and they supplement the pressure available to force fluids back into the well bore after the treatment.

The first reason is the important one in gas wells, and would limit their use to wells in which refined oils or thickened oils are employed. Although there appears to have been some reduction in cleanup time when these materials have been used, in view of the expense and risk involved, it is doubtful whether their use is justified.

A propane spearhead has been used with thickened water in one instance. While no detrimental effects were observed, neither was any reduction in cleanup time noted.

Importance of Injection Rate

As fracturing penetrates outward into a formation under pressure, some of the fluid will be lost as a filtrate into the matrix of the formation. Both fluid loss and the fact that the fracturing fluids must encompass a rapidly increasing area account for a great velocity drop for each inch of the distance traversed by the fluids as they move outward from the well bore.

Extension of a fracture depends upon pressure, and fracturing fluids must maintain sufficient velocity within a fracture so that they will continue to carry sand outward into the formation. Therefore, both pressure and velocity maintenance are vital to fracture extension.

Pressure and velocity maintenance may be accomplished by use of fluid-loss additives and high-injection rates. Two major fluid-loss additives have been developed and are used extensively at this time. Both are petroleum derivatives, and act as temporary one-way plugging agents to seal the face of a fracture, thus preventing fluid from filtering out into the matrix of a formation. These additives are applicable to oil-base fracturing fluids only. There are also other types of fluid-loss additives available for use with acid-oil emulsions.

High injection rates are obtained through pump capacity and horsepower, and are probably the most important of the factors in maintenance of pressure and velocity. Therefore, as high an injection rate as is economically feasible should be maintained during a fracturing treatment.

Determining rate . . . In determining the maximum economical injection rate, well conditions must be considered. If treating pressures anticipated are low and the well can be treated down casing 5½ in. or larger, injection rates of 50 to 70 bbl. per minute are possible. However, a rate of 25 to 40 bbl. per minute on initial treatments is probably the best insofar as the results per dollar are concerned. Riverfrac treatments fall in this classification because they must proceed at an injection rate of at least 30 bbl. per minute.

In many wells, treating down the casing is not possible. Cable-tool holes with line-cut pipe, old wells with corroded casing, and wells with abnormally high treating pressures are all conditions where tubing and a packer will be required.

When tubing is used, friction loss due to pumping viscous fluids through pipe of small cross-sectional area determines the economic limit of injection rates. With 2-in. tubing in the hole, for example, an injection rate of 6 bbl. per minute can be obtained at a treating pressure of 2,500 psi. Use of an additional pump truck of the same size would possibly increase the treating pressure to well above 3,000 psi., while increasing the injection rate only 1 or 2 bbl. per minute. Such an increase in injection rate certainly is not economical.

Experience has shown that the following injection rates may be economically attained at pressures of 3,000 psi. or less: (1) 2-in. tubing, 7 bbl. per minute, and (2) 2½-in. tubing, 10 to 11 bbl. per minute.

Experience also has shown that for best results in gas-well treating, an injection rate of 5 bbl. per minute or more should be maintained regardless of horsepower requirements.

Case Histories

The following wells are typical of results obtained from various types of fracturing treatments used in the Oklahoma-Arkansas area.

Well No. 1—Refined-oil treatment; Sebastian County, Arkansas; Atoka sand. Casing perforated, four shots per foot, from 4,511 to 4,532 ft.

Treatment: 10,000 gal. green refined oil and 20,000 lb. 20-40 sand. Initial production, 1,150 M.c.f. per day. Production after treatment, 3,000 M.c.f. per day.

In this well, only 60 per cent of the green oil had been returned to the surface within the first 8 days following completion of the treatment.

Well No. 2—Thickened-oil treatment; Sebastian County, Arkansas; Atoka sand. Casing perforated, eight shots per foot, from 4,123 to 4,137 ft.

Treatment: 500 gal. mud acid (swabbed back), 10,000-gal. propane spearhead, followed by 8,000-gal. thickened diesel oil and 11,000 lb. 20-40 sand. Initial production, 750 M.c.f. per day. Production after treatment, 6,000 M.c.f. per day.

This zone had cleaned up and was producing dry gas 5 days after completion of treatment.

Well No. 3—Acid-oil emulsion treatment; Franklin County, Arkansas; Hale (Atoka series) sand. Casing perforated, eight shots per foot, 5,605 to 5,647 ft.

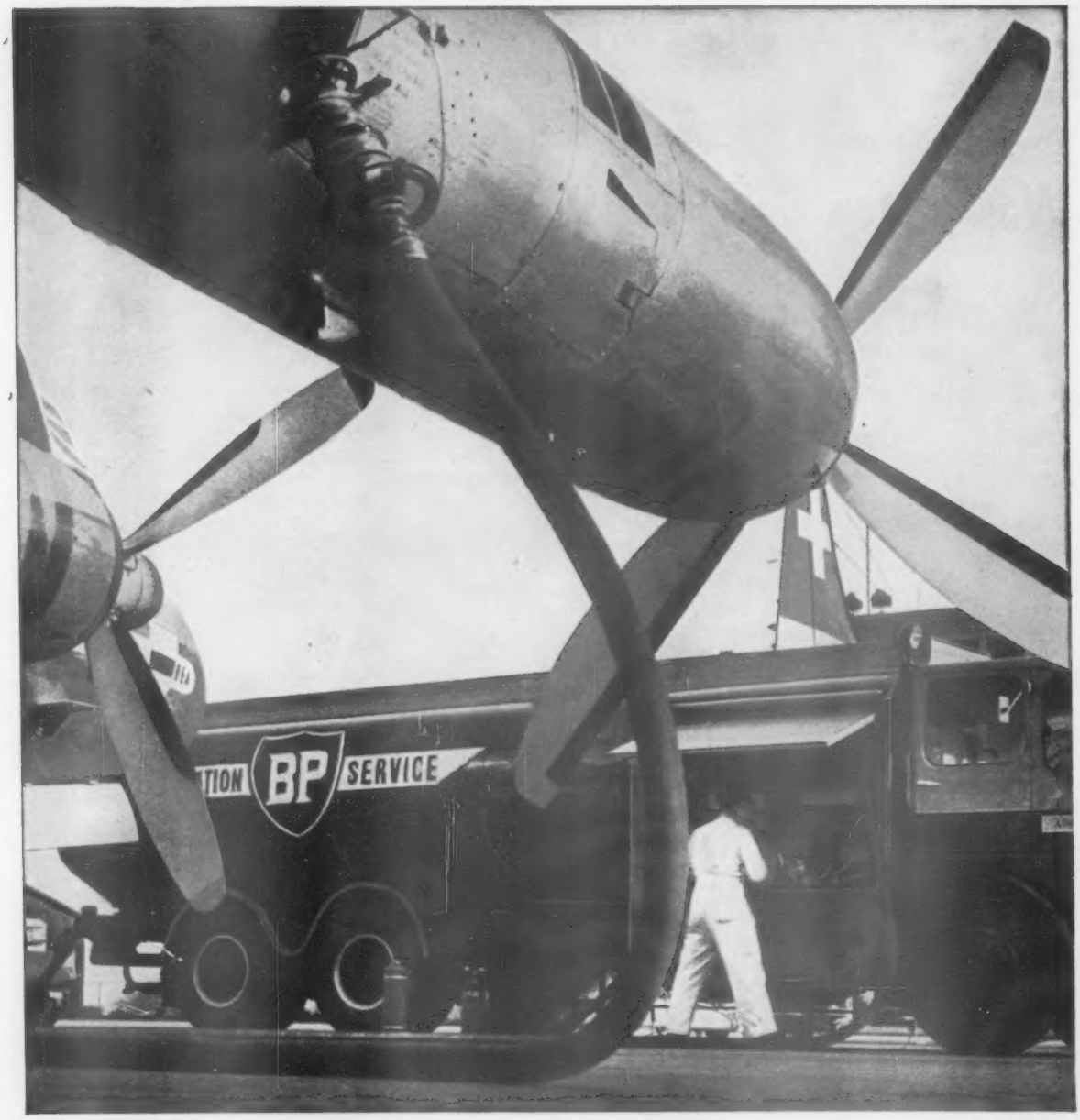
Treatment: 5,000 gal. acid-oil emulsion and 5,000 lb. sand. Initial production, 100 M.c.f. per day. Production after treatment, 15,000 M.c.f. per day.

This zone cleaned up in slightly less than 4 days.

Well No. 4—Thickened water treatment; Franklin County, Arkansas; Orr (Atoka series) sand. Casing perforated, four shots per foot, 5,348 to 5,367 ft.

Treatment: 5,000 gal. of thickened water and 7,500 lb. of 20-40 sand. Initial production, 2,000 M.c.f. per day. Production after treatment, 11,000 M.c.f. per day.

This well had cleaned up and was producing dry gas within 5 days following completion of treatment. **End.**



BP SERVES THE AIRLINES

TODAY'S MOST MODERN fueller, whose design was originated by The British Petroleum Company, is here seen servicing a B.E.A. Viscount.

The BP Aviation Service is a familiar friend of many of the world's most famous airlines. Its green and yellow fuellers are seen on runways all over the globe.

In the air, on land and at sea, BP products and BP research are speeding the pace of progress.

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On the West Coast . . .

Washington Gets New Plants

NEW refinery construction in the West Coast area is most active in the State of Washington. The Puget Sound area is the site of four new refineries, two of which are already under way, with one scheduled to be completed early this spring. The Texas Co. plans to complete its 40,000-bbl. plant at Anacortes by the end of 1958. U. S. Oil & Refining Co. will put on stream a 15,000-bbl. refinery at Tacoma in May.

Two other companies, Standard Oil Co. of California and Richfield Corp., have purchased sites for building at Everett, Wash. Several other companies have indicated an interest in the area, but have not firmed up their plans.

Outside of Washington, refiners throughout the West Coast region are revamping and adding new process units at a rapid pace.

Alaska-Yukon Refiners & Distributors, Ltd., will complete a 7,500-per day refinery at Haines, Alaska, in 1958. It will include a 2,500-bbl. per day thermal cracking unit. Plant will cost $6,000,000.

Bankline Oil Co. will complete a 4,000-bbl. per day Sinclair-Baker unit at a cost of $1,000,000, and a 4,000-bbl. per day hydrodesulfurization unit at Bakersfield, Calif., in September 1957. Engineering is by D. Reynolds. An 800-bbl. per day alkylation unit is being revamped by the company's staff at a cost of $500,000.

Douglas Oil Co. will complete in June 1957, a 1,500-bbl. per day Unifiner at Bakersfield, Calif. It will also add 12,000-bbl. per day crude capacity by December 1957.

General Petroleum Corp. will spend $8,000,000 on a 12,000-bbl. per day Sovaformer at Torrance, Calif. Project is being engineered by Socony Mobil Oil Co., Inc., and Bechtel Corp. Construction is by Ralph M. Parsons Co. Completion is scheduled for October 1957.

A 9,000-bbl. per day Sovaformer is being added at Ferndale, Wash. Construction is by Bechtel Corp. and is to be completed September 1957.

Golden Bear Oil Co. at Oildale, Calif., is contemplating additional furfural extraction capacity, and the modernization of acid treating. It is planning to add 500-bbl. per day hydrogen-treating capacity at a cost of $350,000. A project for increasing crude capacity to 4,500 bbl. per day is to be completed by D. Reynolds in March 1957, at a cost of $100,000.

Hancock Oil Co. is adding 7,000-bbl. per day crude capacity, 3,450-bbl. per day visbreaker capacity, and 2,100-bbl. per day T.C.C. capacity at Signal Hill, Calif. Construction and engineering is by Ralph M. Parsons Co.

Imperial Oil, Ltd., is adding a 5,800-bbl. per day Powerformer at Ioco, B. C., Canada, to be completed December 1957. A prefractionator and Hydrofiner are also being added. Cost will total $4,000,000.

Mohawk Petroleum Corp. is adding a 925-bbl. per day Unifiner at Bakersfield, Calif., to be completed June 1957.

Phillips Petroleum Co. and Pacific Petroleums, Ltd., are building a $15,-000,000 refinery at Taylor, B. C., Canada. It will include distillation, catalytic desulfurization and reforming, dehydrogenation, butane isomerization, and alkylation. Pacific Petroleum, which will be the operator, will build the refining units, and Phillips will build the avgas unit.

Richfield Oil Corp. plans a new refinery at Everett, Wash.

Rothschild Oil Co. is adding an 8,000-bbl. per day catalytic cracking unit at Santa Fe Springs, Calif., at a cost of $2,000,000. Work is being done by C. F. Braun & Co.

Royalite Oil Co., Ltd., is adding a 1,000-bbl. per day Platformer and a 1,500-bbl. per day Unifiner at Kamloops, B. C., Canada, to be completed October 1957.

Shell Oil Co. is adding a multi-million-dollar 2,400-bbl. per day alkylation unit at Anacortes, Wash. Engineering and construction is by Fluor Corp.

Standard Oil Co. of California will complete in May 1957, a 25,200-bbl. per day residuum stripper at El Segundo, Calif. Construction is by Fluor Corp., Ltd. Crude capacity will be increased by 12,000 bbl. per day, and vacuum capacity for charging topped crude by 20,000 bbl. per day before the end of 1957.

A $75,000,000 plant will be built at Everett, Wash. Capacity is in the range of 60,000 to 100,000 bbl. per day.

Crude capacity at Richmond, Calif,. will be increased by 38,000 bbl. per day by late 1957.

Sunset International Petroleum Corp. (formerly Sunset Oil Co.) will increase visbreaking capacity by 800 bbl. per day at Torrance, Calif., by March 1, 1957. Cost of the project is $200,000. Engineering is by U.O.P. and construction by So. Engineering & Construction Co.

The Texas Co. will complete a refinery at Anacortes, Wash., January 1, 1959. It will include 40,000-bbl. per day crude capacity, 25,000-bbl. per day fluid catalytic cracking capacity, 7,000-bbl. per day Platforming capacity, and a catalytic polymerization unit, a sulfuric acid alkylation unit, and a hydrotreating unit. General construction is by Bechtel Corp. Furnishing and erection of tankage is by Chicago Bridge & Iron Co.

Tidewater Oil Co. is adding a 22,-500-bbl. per day Houdriformer at Avon, Calif., to be completed March 1958. Engineering and construction is by Bechtel Corp.

U. S. Oil & Refining Co. will complete its Tacoma, Wash., refinery in May 1957. Plant will have 15,000-bbl. per day crude capacity, 10,000-bbl. per day combination topping, vacuum and thermal cracking capacity, 2,500-bbl. per day Houdriforming capacity, and a catalytic polymerization unit. Work is being done by J. B. Gill Co.

Union Oil Co. of California is adding a 14,500-bbl. per day Platformer at Wilmington, Calif., at a cost of $12,000,000. It is in the engineering phase and is being handled by C. F. Braun & Co. A 15,750-bbl. per day Unifiner also will be added.

Wilshire Oil Co. will complete a 10,000-bbl. per day Platforming-Unifining unit at Norwalk, Calif., in March 1957, at a cost of $2,700,000. Work is being done by Stone & Webster Engineering Corp.

PHOTO COURTESY RICHARDSON & BASS COMPANY

"For the world's deepest hole we use the world's best lighting protection —NEOPRENE!"

Says G.G. (Pinky) Jordan
Toolpusher,
Richardson & Bass
Rig 25

"In drilling our four-and-a-quarter-mile hole near New Orleans," continues Pinky Jordan, "we had to have adequate, troubleproof lighting. It's good safety insurance to have vaporproof light sets protected with neoprene."

When Pinky says "protected," he means it. Resilient neoprene seals on lights and junction boxes are unaffected by sunlight and heat from the lamps . . . give lasting protection against moisture and gas.

And neoprene jacketing on the light cable guards against deterioration from oil, grease, sunlight and heat. *Any* neoprene product can cut your replacement costs through long, trouble-free service. Hose, packings, vibrator screen mounts, drill-pipe protectors and piston rubbers are a few of the applications in which neoprene offers long life and outstanding resistance to deterioration.

FINAL ADJUSTMENT is given a Rig 25 light by driller H. D. (Douglas) Wright. Long-lasting neoprene in this lighting system helped keep lights burning continuously during drilling of the four-and-a-quarter-mile hole. (Photo courtesy Hutchison Manufacturing Company, Houston, Texas.)

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BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

The rubber made by Du Pont since 1932

This lady owns an oil well!

Not literally, perhaps, but for all practical purposes she has a stake in most every oil well the world around and enjoys benefits that she could not buy individually with the revenue from a dozen gushers.

For from oil come many of the luxurious necessities that make her life easier, the modern cosmetics that make her lovelier, and the miracle fabrics that give her the chic that is the birthright of every American woman.

Many of these modern blessings are a result of the refining industry's broad use of Universal created and developed processes which have helped refiners everywhere provide the petroleum by-products that make them possible. UOP is proud of the part it has played in helping American women to be smartly dressed, lovelier, and so, happier.

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Forty Years Of Leadership In Petroleum Refining Technology

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—80

Here's a New Heat-Exchanger Design

A RATHER new development of recent years appears in Fig. 4. This is an air-cooled heat exchanger in which the hot fluid is cooled by air blown past the tubes in the fan below.

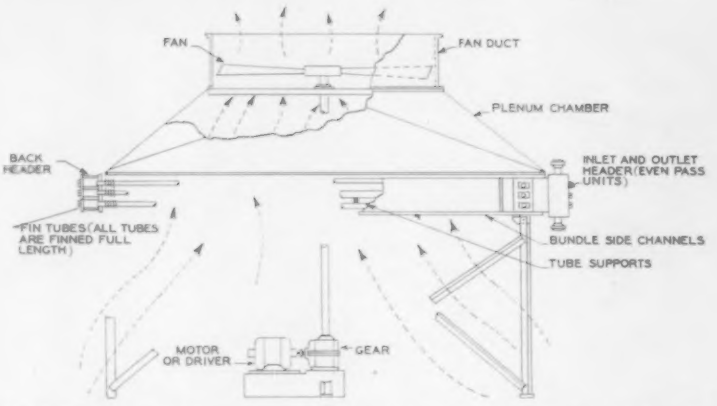
This type of exchanger is used widely in areas of West Texas where cooling-water supplies are limited.

Shell and tube . . . The vast majority of refinery heat-transfer equipment is the shell-and-tube type of heat exchanger. A shell-and-tube exchanger consists of a number of parallel tubes enclosed in a cylindrical shell. One fluid flows inside the tubes and is called the tube-side fluid; the other fluid flows outside the tubes and is called the shell-side fluid. All shell-and-tube heat-transfer equipment is composed of the same basic parts but some of these parts are arranged to produce the desired results.

Fig. 2 (see Part 5 of this series) is a section of such an exchanger with the parts numbered and parts indicated by the chart in the lower portion of the drawing.

Many variations of this design are possible by using various kinds of tubes, different types of baffles, and by providing different arrangements of partitions in the covers to produce variations in flows. Such a variation is the kettle type of reboiler shown in Fig. 5.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.



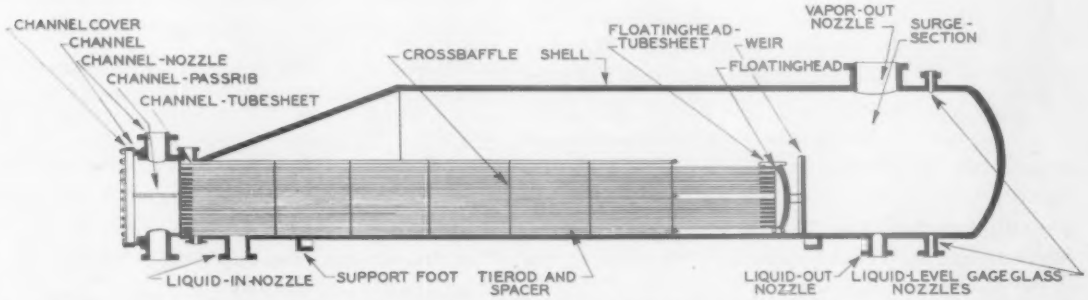
AIR-COOLED heat exchanger in which hot fluid is cooled by air blown past the tubes in the fan below. Fig. 4.

Hairpin tubes . . . Straight, bare tubes are used most commonly but for certain applications other kinds are advantageous. U or hairpin tubes are used to permit free expansion and contraction of the bundle and shell without the use of a floating tube sheet.

This is done in order to prevent product contamination by a possible gasket leak at the floating end. However, such tubes cannot be used where the tube-side fluid is susceptible to fouling because it is difficult to clean the curved portion of the tube.

Finned tubes (see Part 5 of this series) are used often to improve the heat-transfer efficiency of a unit.

Basic to exchanger thermal design is baffle arrangement and mechanical design. There are two general types of baffles: transverse and longitudinal. Both are used to increase the rate of heat transfer by increasing the velocity of the shell-side fluid.



CROSS-SECTION of kettle type of reboiler which has two intube passes. Tube bundle may be removed quickly. For small bundles through 24-in. diameter, bundles slide out on crossbaffles, over 24 in. the bundles slide out on skid bar. Access to reboiler shell is through end flange which is never less than 18 in. in diameter. Fig. 5.

The Dowell engineer's signals coordinate the operation of the pumpers and blenders on this fracturing treatment.

PETROJEL

Effective fracturing at low cost for quick payout

Petrojel* uses your own lease crude, modified on location with a gelling agent to give it high sand-carrying capacity. The result is an effective, low-cost fracturing fluid designed for quick payout. When crude oil is not available, kerosene or diesel fuel may be used.

The gelled crude has lower surface tension than the original base oil. It does not lose its viscosity when it is pumped through sand, and it has naturally low fluid loss. Thus, Petrojel gives you the full benefit of deep sand penetration plus easier return of the fluid after treatment.

The fluid used in Petrojel resists thinning at temperatures up to 200° F., making it especially effective in high-temperature wells. It is also an ideal treatment for gas wells or oil wells with low bottom-hole pressures.

Regardless of the treatment your well requires, you can depend on Dowell's research facilities, experienced personnel and advanced equipment to give you the best results.

For more information, or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service, or write to Dowell Incorporated, Tulsa 1, Oklahoma.

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Services for the oil industry

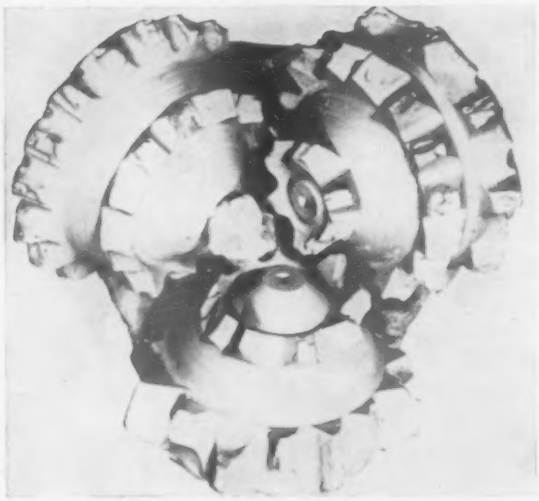
DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

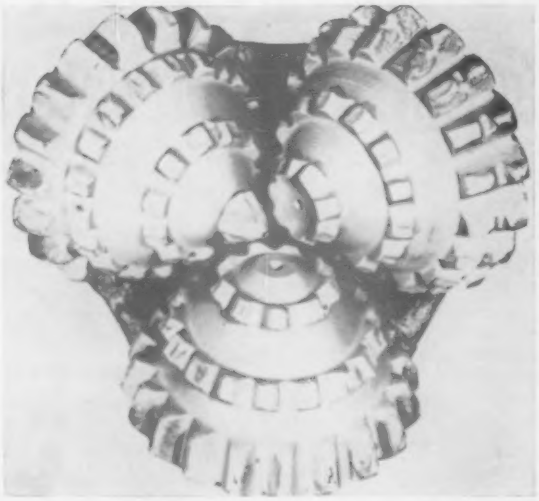
by H. G. Bentson
H. C. Smith Oil Tool Co.

ROCK-BIT DESIGN, SELECTION, AND EVALUATION — Part 16

What Dull Bits Can Tell You



EXCESSIVE tooth breakage. Fig. 31.



UNBALANCED tooth wear. Fig. 32.

EVALUATION of dull bits plays an extremely important part as one of the factors in proper rock-bit selection. In addition, this evaluation often indicates the necessity for changes in other factors which are associated with bit performance.

Some of these factors are bit weight, rotary speed, rotating time, drill-collar stabilization, bit break-in procedure, drilling-fluid condition, and hydraulics.

Loose bearings . . . Excessive bearing wear or failure may be attributed to a number of causes. Since a rock-bit cone rotates about 2½ times for each revolution of the drill string, the total number of revolutions made during the course of the run may be excessive for the type used. A combination of high rotary speed and long rotating time is very often responsible for excessive bearing wear.

As should be expected, heavy bit weights will result in accelerated bearing wear especially if the improper bit type is used. Under these circumstances attention should be given to the possibility of using a type which has greater bearing capacity, or, if this is not advisable, reduced bit weight should be used.

Unstabilized drill collars may also be responsible for this condition particularly if the wear is greater in one or two of the cones. This problem usually can be overcome by using larger drill collars or stabilizers which provide more equal weight distribution on all cones. Excessive sand content in the circulating fluids also may result in excessive bearing wear. Obviously, reduction of the sand content should eliminate this undesirable effect.

Broken teeth . . . A rock bit with an excessive number of broken teeth is shown in Fig. 31. Note this breakage is quite pronounced on nearly all of the rows. A possible cause of this excessive breakage could be that the depth and spacing of the teeth were too great for the formation in which the bit was used.

A change in bit type to one having shallower and more closely spaced teeth may have provided a solution to the breakage. Improper breaking-in procedure, however, may be responsible.

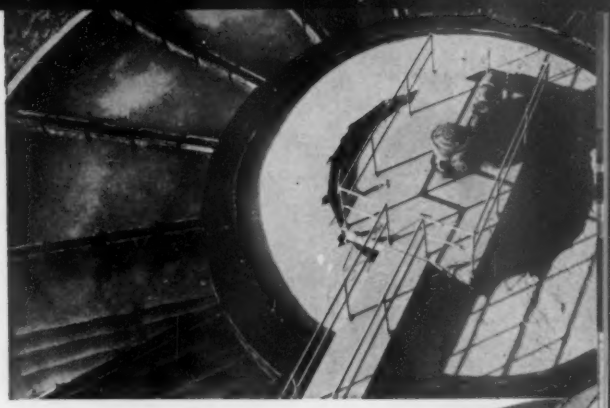
Since the contour generated by the previous dull bit or by a bit having different geometry may not conform to that of the new bit, immediate tooth breakage may occur unless proper break-in procedures are used.

Excessive weight for the type of bit used quite often results in excessive tooth breakage. This is particularly noticeable in the deeper tooth bit types when hard streaks in the formation have been encountered. This problem generally is overcome if lighter bit weights are used.

Uneven wear . . . Fig. 32 shows a rock bit with unbalanced tooth wear. Note in this photograph that, in general, the inner rows are worn to a greater degree than those on the gage. One possible cause of this type of wear may be attributed to the use of an improper type of bit.

Although this type of wear would not be considered serious, a higher rate of penetration might be possible with a bit having deletions in the gage rows. Improper break-in procedures to which a bit may be subjected often create the illusion of unbalanced tooth wear.

INFILCO high-rate treatment equipment is the sure cure for "oil in troubled waters"



High-rate chemical treatment. ACCELATOR® & CYCLATOR® Clarifiers are high rate solids-contact units which in a single basin combine mixing, coagulation and sedimentation operations. *Bulletins 1825 and 850.*

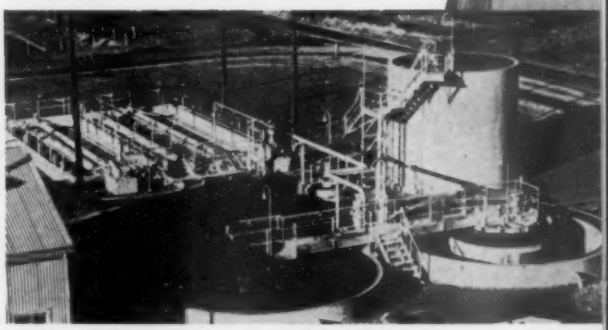
Faced with a disposal problem for oily and other types of industrial waste waters?

Accelerated treatment of such wastes has been a prime objective of INFILCO for over 60 years. You will find INFILCO equipment, with many exclusive features, includes the most efficient, compact units on the market today. Whatever your need, there is *high-rate* INFILCO equipment to meet it. Here are typical examples. You can depend on these units to—

- ***require much less space***
- ***provide uniform and flexible treatment***

It will pay you to consult INFILCO about waste problems because INFILCO KNOWS HOW to help you solve them. Write today for complete information.

Inquiries are invited on all waste treatment problems.



High-rate biochemical oxidation. Oil refinery phenolics and other organic pollutants are rapidly oxidized in AERO-ACCELATOR® plants. *Bulletin 6510.*

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*the **one** company offering equipment for **all** types of water and waste treatment*

FIELD OFFICES THROUGHOUT THE UNITED STATES AND FOREIGN COUNTRIES.

High-rate flotation equipment. SEDIFLOTOR® air flotation clarifiers offer new efficiency for rapid removal of oil, greases and light suspended solids. *Bulletin 6051—OG-28.*

9-59

Last of
Three Parts

FIELD PROCESSING
NATURAL GASOLINE REFINING

GLYCOL-AMINE PLANT OPERATION

How to Minimize Amine and Glycol Losses

by J. W. Cronenberg

A VACUUM pump or steam-jet ejector maintains 20-25-in. Hg vacuum. Flow through the unit is manually controlled by varying either burner pressure in direct-fired units or steam pressure in steam-driven models. Liquid-level controls maintain proper operating level in both still and accumulator. Overhead product is condensed in water-cooled finned-tube exchangers and is pumped from the accumulator back into the main plant stream.

Solution reclaimer . . . Temperature gradually builds up in the still as the flow is held constant. The unit is shut in and dumped to waste when the still bottom temperature reaches 380° F. The function of the solution reclaimer is to remove from the glycol-amine solution undesirable nitrogen compounds[1], iron sulfide, oil, and dirt. Thus, the reclaimer serves a two-fold purpose: to remove solids which tend to foul plant equipment and by redistillation of the amine, to remove decomposition products which are believed to contribute to corrosion.[1]

Increasing on-stream time . . . Solution reclaiming also has increased the on-stream operating time of stills and contactors by retarding the fouling of bubble-cap teeth. To further increase the on-stream period, bubble-cap slot area has been increased in both stills and contactors by removing every other tooth from existing bubble caps.

This has been done without apparently effecting column efficiency. Should cleaning become necessary in some item of plant equipment such as the still column, the plant is shut down.

When heat exchangers or solution coolers require cleaning, they are merely bypassed. However, solution from any part of the plant is carefully drained back to sump and/or storage. In addition, a water rinse of the plant equipment to be cleaned is also carefully recovered to help reduce solution losses. Equipment is then cleaned by using a detergent.

Author is with El Paso Natural Gas Co., El Paso, Tex. Paper presented at N.G.A.A. regional meeting, Odessa, Tex.

Amine and glycol losses . . . Solution losses in our glycol-amine plants for the past 4 years have averaged 4.23 lb. per M.M.s.c.f. of gas handled. These amine and glycol losses account for 9 to 10 per cent of the total cost of gas treated. Solution losses can be minimized by:

1. Maintain adequate solution cooling so that vaporization losses of amine from the contactor will be reduced.
2. Reduce mechanical carryover from contactor by not exceeding design capacity of equipment.
3. Install an adequate gas outlet scrubber to recover entrained solution.
4. Maintain sufficient reflux to prevent amine carryover from the still. Test reflux water daily for per cent amine. If amine percentage exceeds 0.50 per cent, check still rectifying section for possible failure.
5. Tie in all plant equipment drains to plant sump.
6. Eliminate all leaks. Provide pumps with mechanical seals.
7. Reduce, or if possible, eliminate corrosion, which necessitates the unnecessary handling of plant equipment and subsequent mechanical losses by solution.

Corrosion Most Important

Of the operating problems presented in this article, corrosion is by far the most important. If corrosion could be eliminated, the other major problems such as equipment fouling and solution losses could be either greatly reduced or also eliminated.

Corrosion, however, is a very intricate problem and solutions applicable to one plant do not necessarily apply to any other plant and sometimes do not apply twice in the same plant.

Therefore, El Paso Natural Gas Co.'s approach to the problems presented here are not intended as any panacea. As Pierre Laplace, noted Eighteenth Century French astronomer and mathematician said, "What we know here is very little, but what we are ignorant of is immense."

Reference

1. Polderman, L. D., Dillon, C. P., and Steele, A. B., "Degradation of Monoethanolamine in Natural Gas Treating Service," Gas Conditioning Conference, University of Oklahoma, Norman, March 30, 1955.

The next series . . .

"Regulators, Meters, and Integrators" by J. L. Cottrell deals with:

1. Regulators—weight-and-lever and spring-loaded design, regulating back-pressure, and engine pilot regulators.
2. Orifice meters—installation, meter runs.
3. Dampening meters—bellows meter, chart ranges.
4. Integrators—casinghead charts, reading charts, standardizing chart travel, electronic counter.

25. Construction Wages and Equipment Rental Rates

by W. L. Nelson
Technical Editor

TABLE 1—APPROXIMATE HOURLY WAGES (1946) OF REFINERY CONSTRUCTION WORKERS*
(E.N.R. and author's files)

E.N.R. common	$1.03
E.N.R. skilled construction	1.80
E.N.R. skilled (and semi) mfr.	1.32
E.N.R. unskilled manufacture	1.01
Construction superintendent	2.50-4.00
Timekeeper—field clerk	1.70-2.50
Boilermaker foreman	1.80
Boilermakers	1.61
Bricklayers	1.93
Carpenter foreman	1.85
Carpenters	1.65
Cement finisher foreman	1.93
Cement finishers	1.72
Electrical workers	1.84
Hoist operators	1.55
Iron worker superintendent	2.00
Iron worker foreman	1.80
Iron workers	1.60
Labor foreman	1.45
Laborers	1.05
Pipefitter superintendent	2.20
Pipefitter foreman	1.96
Pipefitters and welders	1.75
Plumbers and gas fitters	1.80
Structural iron workers	1.77
Tractor operator	1.60
Truck driver	1.50
Welding foreman	1.93
Welders	1.72
Average skilled refinery construction	1.81

*See Table 2 for effect of locality.

TABLE 2—EFFECT OF LOCATION ON COST OF CONSTRUCTION LABOR*
(Multipliers for refinery construction labor†)

Newark	$1.26
Philadelphia	1.11
Baltimore	0.99
Charleston, S. C.	0.79
Atlanta	0.87
Baton Rouge or New Orleans	0.93
Houston	0.98
Fort Worth	1.00
Tulsa	0.97
Topeka	0.93
Kansas City, Mo.	0.99
St. Louis	1.11
Indianapolis	1.03
Detroit	1.08
Chicago	1.08
St. Paul	0.96
Denver	0.96
Billings, Mont.	0.88
Seattle	1.07
Los Angeles	1.02

*Twelve crafts used in refinery construction. Average throughout 1949-1956. †Nelson Index for labor.

WAGE INDEXES—1946-1956
(1946 = 100*)

Wage Indexes (1946 = 100)*

	E.N.R. skilled†	E.N.R. common	Structural iron worker‡	Electricians‡	Pipefitters‡	Painters‡	Refinery construction
1946	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1947	112	115	113	...	112	...	113
1948	125	131	125	124	126	121	128
1949	134	140	130	135	131	127	137
1950	140	148	136	138	135	132	144
1951	148	157	145	149	143	140	152
1952	158	168	151	157	152	149	163
1953	167	181	160	164	158	157	174
1954	175	192	166	168	167	161	183
1955	180	202	171	173	171	172	190
1956	187	209	§179	§182	§177	§175	196

***See Nelson, W. L., Refinery Labor, The Oil and Gas Journal, Nov. 3, 1949, p. 97, for earlier indexes. †Engineering New Record—bricklayer, carpenter, and ironworker. ‡Bureau of Labor Statistics, U. S. Dept. of Labor. §Preliminary.**

TABLE 3—APPROXIMATE BASE RATES—COMPENSATION INSURANCE—FEBRUARY 1949
(Major oil states except Ohio and Pennsylvania which have low rates)*

Carpentry, general	$3.64- 5.41
Concrete work, general	2.90- 5.96
Electrical wiring	1.21- 2.35
Excavation, earth	1.87- 4.37
Insulation	1.80- 2.96
Painting	1.92- 5.30
Sheet metal erection	1.82- 3.82
Steel erection—structural	9.32-22.08
Watchmen and timekeepers	2.45- 4.97
Wrecking	12.04-29.54

*Lowest values shown are often those of Illinois and this state is revising its rates.

TABLE 4—AVERAGE BASIC RATES ON COMPENSATION INSURANCE
(Average of 16 trades,* 1955)

Arkansas	$5.11
California	5.71
Colorado	4.51
Illinois	4.38
Kansas	4.57
Louisiana	6.95
Michigan	3.97
Mississippi	5.69
Missouri	4.89
New Jersey	6.44
New York	9.10
Ohio	3.19
Oklahoma	7.70
Texas	6.37
Wyoming	4.45
Washington	7.02

*Those used most in refinery construction.

TABLE 5—APPROXIMATE RENTAL RATES FOR CONSTRUCTION EQUIPMENT (1946)*

	$/wk.
Air compressors, portable:	
Gas, 125-185 cu. ft.; 100 psi.	48
Diesel, 365-500 cu. ft.; 100 psi.	170
Air tools:	
Pavement breakers, 70-95 lb.	9.50
Vibrators, pneu., power, flexible	12
Hose, ¾-in. per 50 ft.	2.10
Cranes, cap. at ft. radius:	
Truck mounted, 5-7 ton, 10-ft.	168
Truck mounted, 30-35 ton, 10-ft.	800
Dragline excavator:	
Truck mounted, diesel, ¾ cu. yd.	425
Engines:	
Diesel, with clutch, 70-90 hp.	96
Diesel, with clutch, 165-185 hp.	160
Pile hammers:	
Vulcan, single-acting No. 1	80
Hoists:	
Gas, single-drum, 14-22 hp.	16
Gas, double-drum, 28-45 hp.	32
Elect., 3-drum, 47-57 hp.	54
Trenching machine:	
Wheel type, 5-6 ft., 24-in.	190
Tractors, diesel crawler:	
Cat. Mod. D2, 1955, 38 hp.	93
Cat. Mod. D9, 1955, 286 hp.	610
Bulldozer, for tractor of:	
42 hp.	28
150 hp.	63

*Published yearly in the special Construction and Building Costs issue (often September) of the Engineering News Record. It is assumed that rental rates change in nearly the same way as the cost of such equipment.

One man can easily lift three 20-foot lengths of 4" pipe of Tenite Butyrate

92% lighter than cement-lined metal pipe

The approximate weight of a bundle of three 20-foot lengths of 4" pipe made of Tenite Butyrate is only 60 lbs. Cement-lined steel pipe, commonly used for the same purpose, would weigh approximately 720 lbs.

Because this plastic pipe is so light, it is extremely easy to handle. What's more, it can be cut with a hand saw and joined quickly with only slip-sleeve couplings and solvent cement. As a result, pipe made of Tenite Butyrate can be installed faster and easier. A crew of three men can lay 4,000 feet of 4" pipe in only one working day.

And pipe made of Tenite Butyrate is *tough*. It can take rough handling, and all normal back-filling operations.

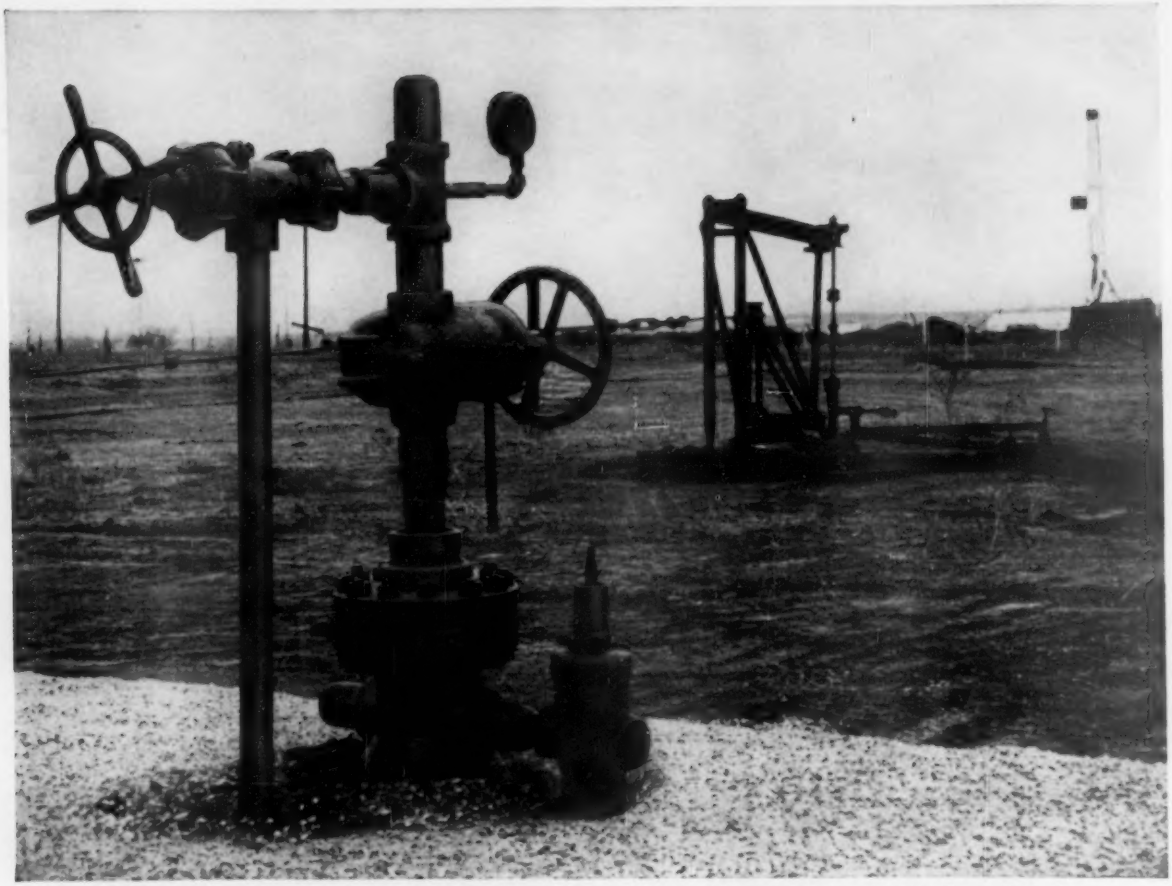
Once in service, pipe of Tenite Butyrate remains free of corrosion—by sour crudes, salt water and alkali soils. Its smooth interior surface provides as much as 40% greater flow volume for any given head loss than does clean metal pipe of the same diameter. Moreover, this smooth surface offers no toe-hold where paraffin can start accumulating.

Could pipe with so many advantages help you in your operations? We will be glad to send you additional information about the properties and applications of pipe made of Tenite Butyrate and also the names of companies that produce the pipe and a complete range of fittings. Address: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

1932—EASTMAN'S 25TH YEAR IN PLASTICS—1957

TENITE
BUTYRATE
an Eastman plastic

A 16-mm. sound-color film, "PLASTIC PIPELINES," is available upon request.



Additional life found by Sinclair in the 40-year old Garber Field is signified by the "Christmas tree" valve (left) which harnesses a newly completed deep flowing well. To the right stands a pump still lifting oil from one of the original shallow wells. In the background at far right a derrick marks the site of additional deep drilling in the rejuvenated field.

Old Faithful of the Oil Fields

"Garber . . ."

This was a magic name in 1916, the year the new-born Sinclair company discovered the Garber Field, about 100 miles west of a booming town called Tulsa.

In its first 40 years, Garber produced *more than 60 million barrels* of oil for Sinclair.

Late last year Garber again leaped into oil country headlines. After long, geological study, Sinclair Oil & Gas Company found additional deep-trapped oil in a field that many thought had passed into history. And Garber should continue to produce for many years to come.

Sinclair's production of crude oil is increasing sharply. And significant new fields found over the past few months in the Louisiana Offshore area, in Venezuela, in Texas, Oklahoma and New Mexico and in the Rocky Mountain area give promise of still greater future production.

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A 10-MINUTE JOURNAL FEATURE

Better Management

RESPONSIBILITY FOR TRAINING

Correct worker privately

Explain corrections when deserved

Encourage new worker frequently

RESPONSIBILITY for job training begins with top management itself—for two obvious reasons. Even in the high echelons of a company, training of some sort takes place—subtle though it may be—and top management must set an example by being "in training" most of the time. Secondly, top management—by selecting subordinates—is selecting the men who will train employes all the way down the line, and management must take responsibility for choosing capable trainers, supervisors, and men who will communicate company know-how and techniques to new employes or employes promoted to new ranks.

The most immediate examples of on-the-job training responsibility are, of course, among the supervisors themselves—the men who work alongside the new employe and teach him the things he has to know to do his job. A supervisor's first responsibility—and it has a direct connection with training—is to get the right worker on the job. The right man in the right place means time saved, higher quality of production, better morale all around. It means **less** training, too. **Easier** training. To meet this responsibility a supervisor obviously must know what it takes to do the job—and something about selecting employes

First of all, a supervisor must understand any particular job in question—he must understand the purpose of the job, what any particular project connected with the job demands, the tasks of the position, and the steps in performing each task. A good supervisor will know **well** every job under his supervision. "Those who can, do; those who can't, teach" is no apt aphorism in modern business or industry. A successful supervisor in charge of training others must be sure he is well-trained himself—he must use his own observations, his own work-distribution studies, and he must learn from the workers themselves and from his superiors. Better-informed supervisors mean better-informed employes. A responsible supervisor also knows how to cooperate with personnel departments in selecting new employes. He must know the sort of man he's looking for and be able to recognize the man when he comes along.

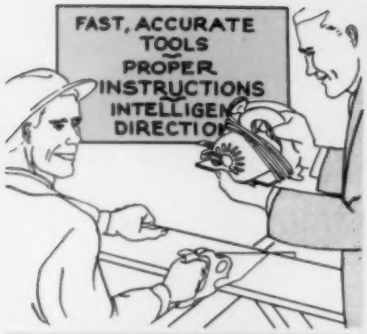
After an employe has been selected for a job, the supervisor's responsibility is to induct the worker into the organization and orient him to his job. This is both a formal and informal process. Sometimes very little training is necessary for a new employe, maybe none at all—and the supervisor must know when training is not necessary, for unnecessary training wastes valuable time and increases worker dissatisfaction. An employe doesn't like to have to "learn" what he already knows. In most cases, though, some training will be necessary—regardless of how carefully a worker is selected he seldom has all qualifications necessary to do the work completely.

A supervisor, therefore, must be able to recognize the need for training in new or old employes—either one. He must size up an employe: what skills does he have, what jobs can he do, what special talents can he use on the new job? The supervisor must measure the gap between what the worker can now do and what the worker must do to fill a new job. The supervisor's responsibility is to close that gap as soon as possible.

Training responsibility actually goes beyond these "employe on the new job" stages, however. Every time a supervisor corrects a mistake, handles a grievance, gives a reprimand, or handles any other worker problem on the job, the supervisor should be instructing.

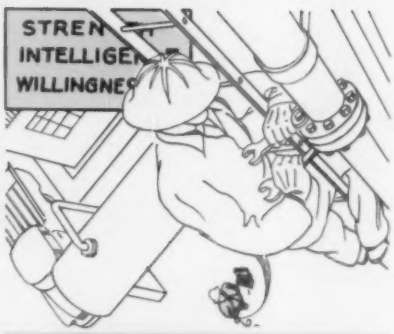
TIPS ON T

FUNCTION OF TRAINING



Improve worker's performance

Understand worker's deficiencies



See that worker fits the job

THE function of training is to make a better company by helping every employe do a better job. Training is necessary because workers do not know how to do everything a job requires of them, or because a company is never working up to its full capacity. Training is of value to the worker, the supervisor, and the company because it can improve work performance, increase production, make for a better company morale.

The first function of on-the-job training is to improve a worker's skill and the quality of his work. The greatest amount of training is given, of course, to new workers, but training must also be designed to prepare old employes for new skills and new job requirements as a result of change in company projects. Training can also help upgrade, provide promotion opportunity for all workers by giving special skills and knowledge that an employe did not originally have when he first came on the job. Essentially the first function is to improve—at all levels—and to introduce employes to changes in equipment, procedure, and company organization.

The second function of training is to help an employe —in an individual and personal way. By increasing a worker's skill on the job and by giving him a better chance to advance, training can increase a worker's general satisfaction with the assignments he is given to do. Good training helps an employe understand better what is expected of him, and it relieves uncertainty and error from his work. All this means an improvement in a worker's attitude, and a happier, healthier personnel.

The third function of training is general company improvement. Good training of employes means a better company because it leads to improved work performance in every area. Proper training—by giving employes improved knowledge, skills, and attitudes — leads to jobs being accomplished more quickly, correctly, and safely. Good training means employes easier to supervise, easier to give directions to, and means less wasted time, fewer mistakes, more satisfaction and less friction with others. Good training makes it possible for employes to know what to do without someone always "looking over their shoulders."

In addition to contributing to better employe relations, training helps the company as a whole by "toning up" the muscles of the organization, giving the entire organization a reserve strength. By helping get new workers up to required production, by developing company-wide systematic work habits, and by improving company morale, training gives a company a competent and flexible work force all around. Good training means that two employes will be capable of performing every job so that the company can rely on "two-deep" strength in job performance. In turn, this training helps the company achieve and exceed production quotas, and it helps see that the work is performed by fewer personnel.

To fulfill its threefold function, however, the training program of any company must be an integrated part of everyday company operation. Training **does not function** when it is considered a mere sideline to the day's business—something to get out of the way before nine in the morning or sometime after four-thirty in the afternoon. Nor does it **function adequately** when it is limited to more or less formal temporary training programs that many companies provide for the new employe right out of college. Proper, full-time training for every employe, in every sphere of company activity, is the foundation for a company's performance.

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TRAINING—1

WORKER GUIDANCE

Stimulate and encourage ideas

Check performance frequently

Spend some time working with trainee

CONTINUOUS **employe training** can be built into the actual everyday operations of a company—if a supervisor keeps in mind that training never really stops. The experienced supervisor knows that he can continue **instruction** and **training** almost every time he comes in contact with his subordinates—and he knows that this is particularly true when it comes to giving orders. Every memorandum, every work order, every request made of an employe—if properly given—can result in teaching a worker more about his job. A poor order, on the other hand, destroys good working habits.

By following simple rules a supervisor can win the respect and confidence of his subordinates as he gives orders and guides them in their work and, at the same time, he can increase and strengthen company morale and job enthusiasm. All he has to do is to follow a few common-sense suggestions.

For instance, an order must be planned in advance: who, what, where, why, when, and how. Complex orders should be broken down into a few, simple steps. An order should allow some initiative. An order should be given to the right person—to the worker who has the ability to carry it out. An order should be thoroughly explained—to be sure an employe understands it completely. A supervisor, once he has given an order, should delegate all necessary authority to the employe, then—keep hands off and let the employe do the job. A supervisor must, of course, set reasonable deadlines and must require compliance, but the knowing supervisor remembers he is giving orders to people, not machines.

One of the main objectives of an order should be to develop initiative. After all, competent workmen able to use controlled initiative are made, not born. Good ideas are there in the workman's mind and it is the job of the supervisor to get those ideas out into the open. This, in fact, is one of the main objects of the whole training program in modern business. Direct suggestions and incentive plans will help unlock mental doors, but the job of really stimulating and encouraging idea development best takes place as the supervisor goes about his business of "bossing the job."

One possible technique for developing initiative in the normal course of giving orders is this: First, the supervisor can give several orders with obvious steps omitted. Then he checks to see that the employe caught the omissions. Second, the supervisor gives several orders with less obvious points omitted. Then he checks to see how well the employe handled the job. Third, the supervisor gives an order outlining only the general ideas. Again he checks the employe's performance. Finally, the supervisor gives only a job suggestion—and begins to watch out for spontaneous accomplishment or suggestions.

As he goes about the job of giving orders and trying to drum up initiative at the same time, the experienced supervisor is going to have to expect the occasional mistakes, the failures to carry out orders, or even substandard work. If he is quick on his toes, however, the smart supervisor will turn these "negative" occasions into opportunities for even more training. When a reprimand is necessary it can be turned into a constructive, learning situation which can build confidence, ability, and respect. The old-fashioned notion that a supervisor has a right to "blow off steam" and show off his authority by "bawling out" offenders is as antiquated as a Model T. The bawl-out is completely negative, destroys confidence and ability, leaves the employe beaten and discouraged.

giving your opinion and suggesting other subjects you would like. Address Editorial Department, request. Also check back for previous feature, January 21, 1957, issue, page 121.

5086

HIGHEST STRENGTH ALUMINUM FOR UNFIRED PRESSURE VESSEL FABRICATION

Kaiser Aluminum now offers you alloy 5086 . . . the highest strength aluminum alloy available for the fabrication of unfired pressure vessels.

Non-heat-treatable 5086 is designed specifically for welded structures requiring maximum joint strength and efficiency, plus light weight and corrosion resistance.

And, with high-strength 5086 you can take advantage of inert-gas, shielded-arc welding methods for faster welds and pressure tight joints.

Development of 5086 by Kaiser Aluminum makes possible many new applications of light weight, durable aluminum for the chemical and petroleum industries. Find out now how this versatile alloy can serve you.

For complete information, call the Kaiser Aluminum sales office listed in your phone directory. Process Industries Department, Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

PHYSICAL CHARACTERISTICS OF ALLOY 5086

Typical mechanical properties in various tempers

	Temper			
	"0"	H32	H34	H112
Tensile strength (psi)	38,000	42,000	47,000	39,000
Yield strength (psi)	17,000	30,000	37,000	19,000
Elongation (% in 2")	22	12	10	14

Allowable design stress values

	For metal temperature not exceeding deg. F.	
Condition (temper)	100°	150°
Annealed	8700 psi	8700 psi
H112	8700	8700
H32	10,000	9900
H34	11,000	10,800

Allowable stress values for welded construction compared with other alloys

Alloy Designation		For metal temperature not exceeding 150° F. (annealed condition)
AA	ASTM	
1160	996A	1650 psi
1100	990A	2350
3003	M1A	3150
3004	MG11A	5650
5050	G1A	4000
5052	GR20A	6250
5154	GR40A	7350
5086	GM40A	8700

Nominal composition

4.0% magnesium
0.45% manganese
0.10% chromium

Typical weld strengths (specimens tested across the weld)

37,000 psi tensile strength
18,000 psi yield strength
13% elongation

Kaiser aluminum 5086 is available in flat and coiled sheet, plate and extrusions.

Kaiser Aluminum

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SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

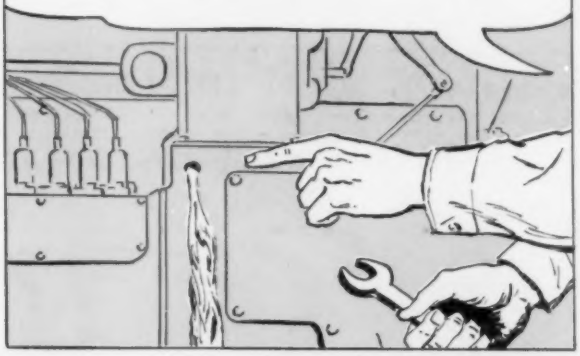
THE CASE OF
THE DANGEROUS DRUMS

THANKS FOR DROPPING BY, ART. THINK I NEED A SET OF NEW INJECTION VALVES.

HMMM, YOUR TRACTOR'S NOT VERY OLD. SHOULDN'T NEED VALVES.

SURE ACTS LIKE IT. THE ENGINE IS MISSING AND LOSING POWER!

BET YOUR TROUBLE'S RIGHT HERE, FRED ----LOOK AT THE WATER IN YOUR FUEL!



FRED, YOU NEED BETTER FUEL STORAGE FACILITIES. WATER AND RUST ACCUMULATE IN THESE DRUMS AND THERE'S NO EASY WAY TO DRAIN IT AWAY. JUST IN CASE THOSE VALVES ARE STICKY, I'LL BE GLAD TO CLEAN AND TEST THEM.

WE CLEANED THE VALVES, FRED. THEY CHECKED O.K. AND ARE READY TO GO.

THANKS, ART. YOU SAVED ME MONEY. BY THE WAY, I ORDERED A NEW FUEL STORAGE TANK TODAY!

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CAT CARE FOR LONGER WEAR

LET ME HELP KEEP YOUR CAT* EQUIPMENT ON THE JOB!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

The engineer learns . . . Last of Two Parts

How to simplify right-of-way problems

by Frank A. Smith

PROPERTY mapping must be done in complete harmony with the drafting department in right-of-way operations. Information from the land department must be supplied to the drafting department as follows:

- Tract numbers.
- Legal description of the lands traversed.
- Full legal name of the last owners of record.
- And the scaled roddage by which acquisition was made.

This information will enable the drafting department to set up preliminary alignment maps with sufficient data to define property lines by legal description to check against field notes of survey parties. This supplies the land department with a revised or rechained roddage basis for dealing with the landowners.

After the alignment maps are prepared, the land department is required to check the names of the legal titleholders and the legal description of the land. The department will determine that the right-of-way traversed has complete coverage and all chances of gaps in the right-of-way are eliminated. Thus, the alignment maps are then ready for approval for construction. And the chances of errors are reduced to a minimum by virtue of the two departments cooperating and checking the data required to complete the alignment maps.

Regulatory requirements . . . Meeting requirements of regulatory bodies is generally an engineering operation. But the land department can, and does, aid materially in acquiring and completing permits. Permission from county, state, and federal agencies is required in acquiring the following licenses, permits, and easements:

1. Highway and road crossings.
2. Navigable river crossings.
3. Drainage districts and contiguous assessment districts.
4. State and federal lands, monuments, parks, and forests.

Author is with Ford, Bacon & Davis, Inc. Article presented before Committee on Pipe Lines, Construction Division, American Society of Civil Engineers, Pittsburgh.

All of the preliminaries of these permits are handled directly by the engineer as he is dealing with other groups of engineers who have charge of the bureaus regulating the different public or private properties. Design drawings, land plats and traverse drawings, and specifications as to type of construction are supplied to the engineering departments in the bureaus having jurisdiction.

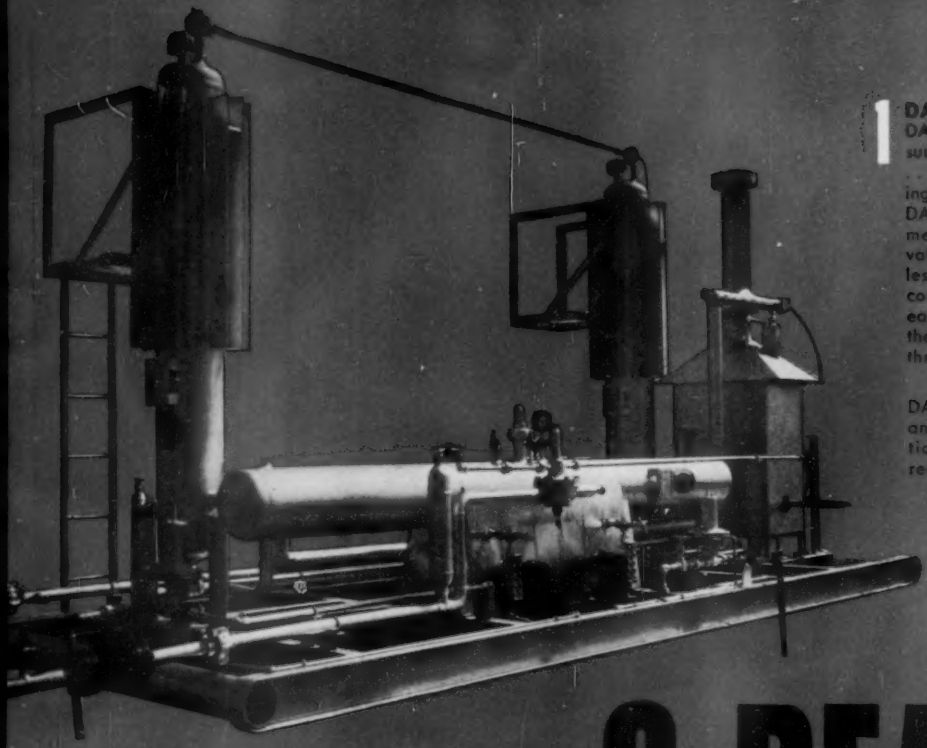
The mechanics of value and payments for easements or permits are generally referred to the land department, which follows through with the acquisition and provides the stipulations concerning restoration of the surface. This includes landscaping, if required, reforestation, resodding, and continuous maintenance of the pipeline installation.

Construction . . . In order for the inspection department to identify the construction maps properly and to control and coordinate the activities of the contractors, it must be supplied with all right-of-way restrictions in the easement. The land department therefore, is required to supply to the engineering department, for later delivery to the contractor—construction-line lists.

This line list identifies each tract of land that construction will cross and in the order that construction will cross. It carries the proper tract number; the name of the landowners and their addresses; the name of the tenant on the property and his address; and most important, the restrictions, additions, modifications and/or deletions that appear in each individual right-of-way grant.

This list enables the contractor to be fully aware of any special restrictions as required on each tract of land, and it is a partial guarantee that these restrictions as required under the contracts will be complied with. The land department also is required to assist the engineer and contractor in every way possible to expedite the construc-

NEWLY ELECTED DIRECTORS of Pipe Line Contractors Association, top row (left to right): G. A. Manuel, president, Williams-Austin Co., Pittsburgh; J. W. Sharman, president, Sharman, Allen, Gay & Taylor, Inc., Houston; Jack S. Gray, president, Grayco Constructors, Inc., Austin, Tex.; Kenneth A. Owen, president, Parkhill Truck Co., Tulsa; John H. Williams, president, Williams Brothers Co., Tulsa; E. G. (Gary) Morrison, president, Western Pipe Line, Inc., Austin; and Richard A. Gump, executive secretary of the association, Dallas. Bottom row (left to right): R. D. Sheehan, general manager, Sheehan Pipe Line Construction Co., Tulsa; R. P. Gregory, vice president, Houston Contracting Co., Houston; James P. Neill, partner and manager, J. P. Neill & Co., Dallas, and new president of the association; M. S. Williams, president, Panama-Williams Corp., Houston; C. C. Bledsoe, vice president, Midwestern Constructors, Inc., Tulsa; and R. A. Conyes, president, R. A. Conyes Construction Co., San Pablo, Calif.



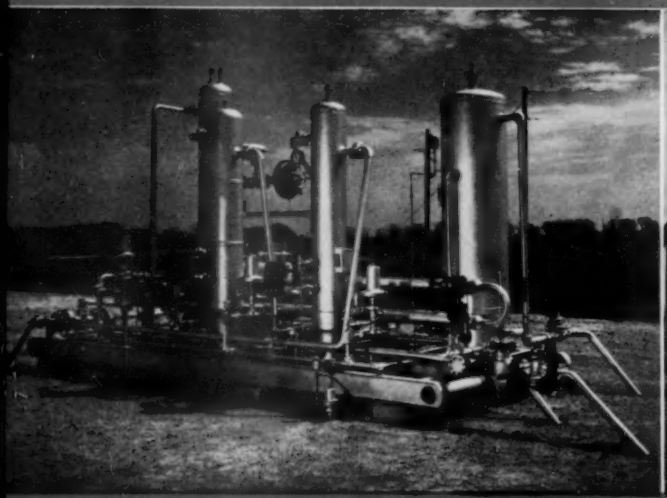
1 **DAU . . .** a Parkersburg exclusive! With DAU, wellhead dehydration of high pressure gas wells is possible for the first time . . . and with real economy, too. Your savings start with the low cost of unit. The DAU requires no costly auxiliary equipment such as separators, piping and valves. Because the DAU uses 80 per cent less fuel gas, your savings on operating costs can amount to hundreds of dollars each month. And checking corrosion at the wellhead saves on equipment wear throughout the flow system.

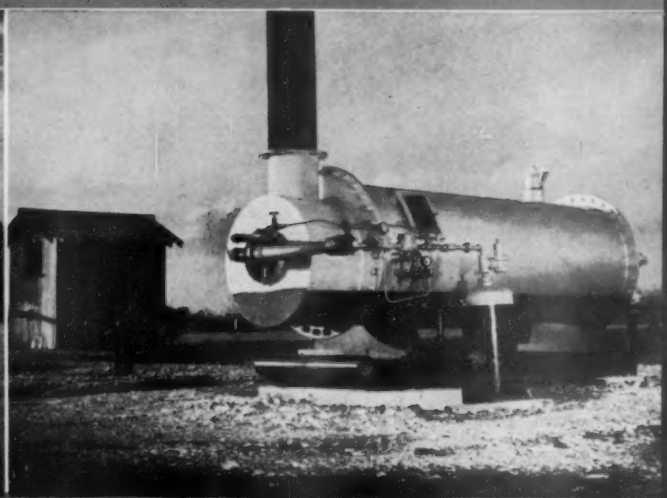
Available in two basic types: (1) The DAU Weldrier for wellhead dehydration; and (2) The DAU Welsorber for combination dehydration and hydrocarbon recovery.

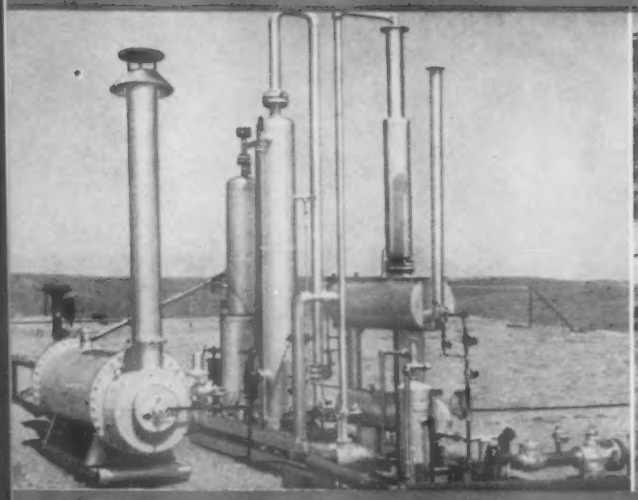
6 REASONS

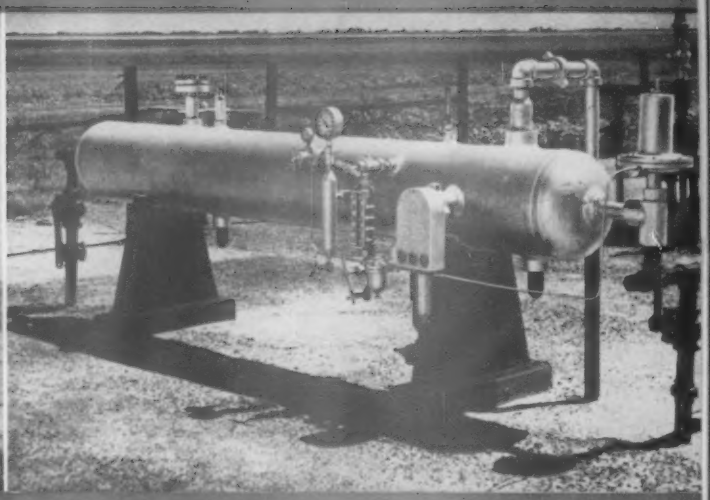
2 **HYRECO . . .** another significant Parkersburg development. Parkersburg pioneered the design and development of this equipment to obtain high recovery rate by cold separation. Top performance attained through such Parkersburg features as use of horizontal and vertical separators to isolate warm liquid zone from cold gas zone for maximum recovery and minimizing danger of freezing; vertical knockout for complete removal of liquids before well stream enters cold zone of high pressure separator; and liquid level controller, used to regulate elimination of hydrocarbons from warm zone of separator, that gives hair trigger sensitivity, freedom from freezing, and freedom from plugged bleed holes. Available in capacities from 2.5 to 15 MMCF/D; pressures from 2000 to 6000 psi with either single tube or twin tube vertical knockout for liquid removal.

3 **HEATERS . . .** superior quality and performance. Parkersburg heaters are available in both direct fired and indirect heater types with capacities from 90,000 to 4,000,000 BTU's. Exclusive heating tube design eliminates hot spots and scale deposits, gives more efficient, economical and dependable service. Indirect heaters now feature new, modern jet-type burner and pilot that requires no air-fuel adjustment, gives maximum flame stability because only primary air is used with fuel gas, and, because of design of wall-tight burner box and flame stability, is practically immune to ill effects from crosswinds. Finest auxiliary control equipment available insures peak effectiveness. All valves and regulators used on Parkersburg heaters are designed for oil field application.









4 **GLYCOL TYPE GAS DEHYDRATOR** . . . a self-contained, completely automatic unit that will eliminate most hydrate problems. Proven performance in extremely cold temperatures. Economical operating cost, using natural gas as source of power. Available in standard sizes to handle up to 10,000 MSCFD and up to 1500 psi operating pressure.

5 **OIL AND GAS SEPARATORS** . . . available in vertical and horizontal types. Parkersburg single-tube separator gives more gas flow area, more interface area and more retention time for greater separation. Whether your need is for a single-tube, two stage, three phase, vertical or metering separator, there is a Parkersburg separator to fit your requirements.

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We are known by the equipment we keep. Parkersburg production processing equipment is the recognized leader in the field . . . a leadership gained through pioneering new designs and applications of equipment to meet any field problem. Operators everywhere buy Parkersburg with confidence because they know the superior performance that is built into each piece of equipment. If it is a Parkersburg, it is designed right and built right for leadership and engineered to meet specific field conditions.

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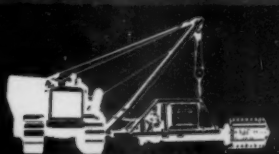
INTERNAL LINEUP CLAMPS



DITCH PADDER

CLEANING & PRIMING MACHINES

tion of the pipeline by making preliminary landowner contacts in advance of construction. The landowner is advised as to the time of construction and when fences will be cut, so that proper care for livestock can be planned.

Other functions of the land department during construction are:

- Acquire extra working space when required.
- Obtain permission to use access roads.
- Rent temporary storage areas.
- Eliminate hazards during construction by observing that crews have placed warning signs and lights at road crossings and cuts.
- See that temporary fencing and gates are kept closed.
- And advise the spread inspector of any negligence by the contractors so that off right-of-way, livestock, and personal damage claims can be kept to a minimum.

On small jobs the land department, by advance contact with landowners, can determine the type of cultivation and terrain to be found. The engineer will be advised of the time that crops will be planted or harvested so that construction schedules may conform to farming programs, where possible, and crop damage can be kept to a minimum.

Construction damage . . . This is a major responsibility of the land department. It is usually a long drawnout procedure, and warrants a complete discussion in itself. But there are two requirements which affect final acceptance:

1. That the contractor has fully performed all special conditions as indicated in the construction-line lists and contained in the grants of easement.
2. That the land department maintain continuous landowner contacts after construction to keep down complaints and to provide a resume of unsettled damage claims. Maintenance crews can then be advised properly of existing conditions.

Conclusion . . . Operations involving right-of-way generally affect the engineer directly. Cooperation and understanding between these two departments is essential to bring a project to a successful conclusion.

The engineering department often believes a land department is a burden, adding greatly to the work load. On the contrary, the land department is a vital and important function of engineering itself, for after all, you cannot construct a pipeline if you don't have a right-of-way to construct it upon.

Water pipelines offer opportunity

. . . A new field for pipeliners

THERE may be a new era ahead for pipeline builders. There are a lot of "ifs" involved, but pipeliners may some day find a big opportunity in the field of high-pressure water lines.

Many sections of the nation are in a desperate plight with respect to water supplies. Drought damage now has extended to areas which have never had water troubles before. Many solutions have been advanced to solve this problem. And pipelines are mentioned prominently in them.

General Contractors

Large water mains have been laid to serve cities and towns. The smaller sizes are of cast-iron pipe and the larger ones are often of reinforced concrete. These lines usually have been laid by general contractors. Why?

Probably the reason is that the pipeline-contracting industry has grown so specialized in welded steel lines for the oil industry it has given little thought to moving nonpetroleum liquids. But pipeliners can do more than lay lines for oil and gas movement. Proof of this is offered by the slurry lines built for Pittsburgh Consolidation Coal Co. and American Gilsonite Co.

Schemes to transport water from the Red River of the North, and even Lake Superior, into areas as far away as the Pecos Valley into New Mexico, have already been considered. There is a project in California which would move water from dams on the Feather River some 700 miles into San Diego County. In Oklahoma, a plan is being studied to transport water from the southeastern part of the state some 200 miles to the central section.

Long range . . . Of course some of these projects are long range. But there is no question but that many of them will actually be built because people will demand the water. Economics will dictate the engineering plan. Perhaps pipe-

Extracted from a paper presented by Col. Francis J. Wilson, Arkansas Basin Authority, Tulsa, formerly with U. S. Army Engineers, before Pipe Line Contractors Association annual convention at Boca Raton, Fla., January 14-16, 1957.

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PIPELINE PATROL

lines will be used, or possibly open canals. But it should make little difference to pipeline contractors which have already shown a capacity for organizing and training highly efficient field crews. They can surely adjust operations to solve new problems that will involve new methods and probably new materials because every growing town and city is a potential client.

Many water lines have been built of reinforced concrete pipe. However, in one study that is known a 66-in. welded steel pressure line, wrapped and given cathodic protection on the outside, with ½ in. of dense cement mortar on the inside, proved to be competitive with reinforced concrete pipe. And it promised to have about the same life. This shows how the techniques with which pipeliners are familiar can be used to serve the needs for moving large volumes of water. But rising steel prices may dictate use of concrete pipe. If so, that should create no problem for the pipeliner.

There is a place for the pipeline contractor in the tremendously growing business of moving water. Whether or not he is able to get a share of this work will depend on his willingness to take on a new problem.

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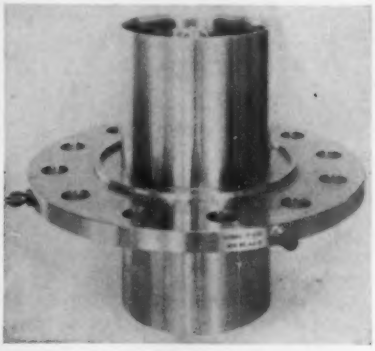

New pipeline meter

THIS new meter for pipeline use is a 7-in. unit designed for mounting between two flanges and is capable of handling flows of 600 to more than 4,000 bbl. per hour.

Made by Potter Aeronautical Co., the sensing element consists of a housing designed to adapt directly into the piping. A hydraulically self-positioned rotor is suspended within the housing.

The frequency of the output signal varies directly with the flow rate. This signal can be used to operate rate, ratio, or total flow indicating, recording, and controlling instruments. The a.c. output also lends itself to long-distance transmission.

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Wheaton T-1700 Gauge Hatch

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With Wheaton Gauge Hatches you get vapor-tight seating — a dependable way to reduce evaporation losses in cone roof, and low-pressurized storage tanks.

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Get Wheaton *precision* in gauge hatches and other tank fittings — backed by 65 years of experience in the development of petroleum and chemical equipment. Send for Catalog No. 66, which illustrates and describes the complete line of Wheaton Tank Fittings.

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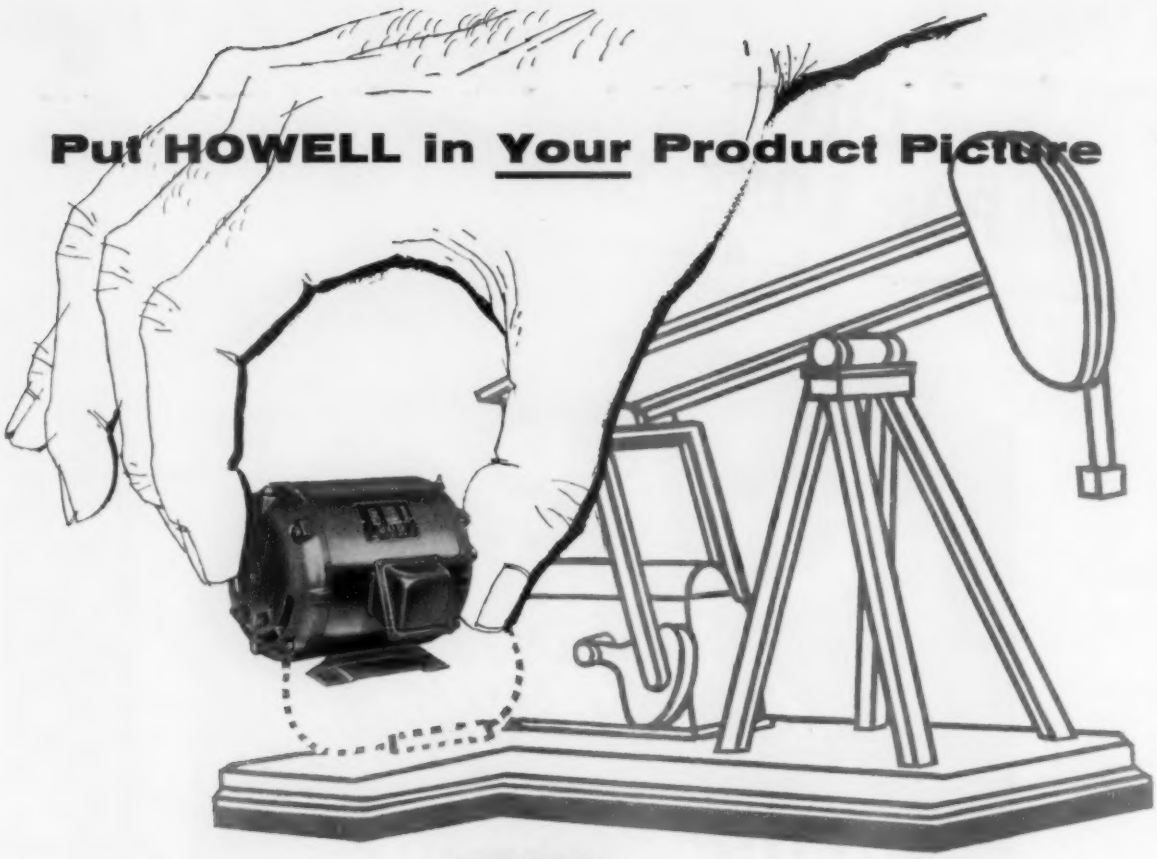
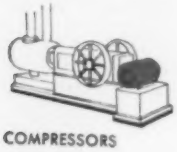


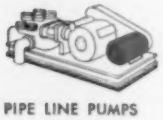
...and gain the PLUS values in power that count!

PROCESSING PUMPS

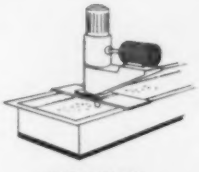
MOTORIZED VALVES



COMPRESSORS



PIPE LINE PUMPS



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EXTRA DEPENDABILITY that challenges the years. Howell's new principle of heat-source ventilation . . . double sealed bearings . . . tough rolled steel frames and precision fitted cast iron end plates . . . these and many more are plus values that ***count!***

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Howell weather-protected motors, in sizes up to 300 hp, are ideal for heavy-duty applications. They're rodent-proof, rust-proofed inside and out, and stream-lined — no external fins or ribs to accumulate dust and dirt. Howell also makes standard open, TEFC and explosion-proof motors, gear-motors and part winding motors for oil industry applications.

Howell motors are specified and used by these leading manufacturers of oil production equipment:

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A Howell sales engineer can give you valuable assistance on any motor application. Wire or 'phone collect . . . or drop us a line . . . you'll get prompt action. Howell Electric Motors Co., Howell, Michigan.

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. . . precision built for industry since 1915

Among the

Drilling Contractors

Denver Contract-Drilling Firm Conducts Employe Supervisory Training Program

CARPENTER-TRANT DRILLING CO., Denver, is carrying out an integrated educational program designed to improve supervisory and management capacities of its employes.

Included in the program are group conferences with field personnel dealing with supervisory and management problems and responsibilities.

The first of these conferences was conducted recently at Worland, Wyo. It was of 4 days duration, and was attended by 23 company men, including several company executives from Denver, tool pushers, and various drillers, and other crewmen from rigs working in the Wyoming area.

This conference took up "Fundamentals of Supervision," a basic course for supervisors concerned with human relations and leadership aspects of their jobs as they pertain to company and intracompany and customer relations.

It was conducted by M. L. Powers, director of business and industrial services at the University of Oklahoma, Norman. Objective is to bring about a better understanding by the supervisor of his duties and responsibilities as a part of the management group, so that he can represent his company correctly to his men.

Topics consisted of: Management Function, Management Chain, Types of Supervisory Effort, Fundamentals of Leadership, Basic Human Wants, How a Supervisor Meets His Responsibilities, Customer Relations, Handling Personnel Problems, Individual Differences, Other Supervisory Relations, Induction of New Employes.

A similar conference is scheduled to be held in May. In addition to these major conferences, the company is conducting a series of smaller meetings of the similar type on each rig every month.

Carpenter-Trant Drilling Co., headquartering in Denver and Casper, was organized in 1945. It has been active in the Wyoming area for the past 5 years, and currently is operating three rigs in the Big Horn basin.

Gracey-Hellums Drilling Co., Houston, is putting a rig to work in the Simon Pass area, at the north edge of Lake Palourde, 6 miles northeast of Morgan City, in St. Martin Par-

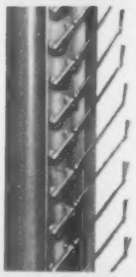
ATTENDING Carpenter-Trant Drilling Co.'s Worland, Wyo., conference on supervisor-personnel relations were: Back row, left to right, Ozzie E. Blanton, mechanic; Roy Kappus and Robert Stork, drillers; Mike Shafer and W. I. Burch, tool pushers. Middle row, Warren C. Wages, derrickman; Garlin M. Taylor, driller; Ralph Roble, tool pusher; C. W. Stockman, driller; Kenneth Christner, accountant. Front row, M. L. Powers, leader of the conference; William H. Carpenter, president; John Anderson, field superintendent; George E. Mendenhall, Jr., treasurer. Present but not in picture were O'Dell R. Freeman, rig floorman; W. J. Deen, derrickman; and D. Sigman, motorman.

B and W Inc.

FOR A

GOOD CEMENT JOB

B & W Hinged Nu-Coil Scratcher



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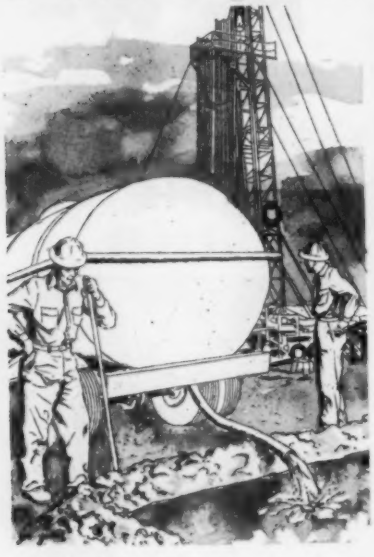
Brine in the pit . . .



Like money in the bank

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Brine is about one-third the cost of drilling muds. Drilling salt sections with brine guarantees a bit size hole, thus saving hundreds of dollars on cement jobs. So when you use Ready-Made brine it's almost like putting money in the bank.

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Toland Brine Service, Inc.	Kermit, Tex.
The Brine Co.	Midland, Tex.; Hobbs, N. M.

ish. There, it is under contract to Union Oil Co. of California for a 13,500-ft. test at 1 Brownell-Kidd, in 15-15s-13e. California Co. has completed two gas-condensate wells in the area, which is about 2 to 3 miles northwest of Lake Palourde field.

Circle Drilling Co., Lake Charles, La., has a new contract operation in northeastern Jefferson Davis Parish, southern Louisiana. It is set up as a 9,300-ft. test with Colorado Oil & Gas Corp. of Houston, as the operator. Location, at 1 Lock-Moore, in 28-7s-6w, is about 1½ miles east of Indian Village field, and about the same distance northwest of Bayou Serpent field.

Carnes W. Weaver Drilling Co., Houston, has two new contract jobs going in South Louisiana. One is a 13,000-ft. wildcat test for Union Oil Co. of California in the eastern part of Atchafalaya Bay, in Terrebonne Parish. Location, on State Lease 2923, is about 1½ miles offshore at a point about 5½ miles southwest of Plumb Station. The other is another 6,500-ft. well for Michel T. Halbouty on the southeast side of West Hackberry dome.

Oil Corp. has taken another contract job in South Texas. It will drill a 9,000-ft. wildcat test for Hargrave Oil Corp. 5 miles north of Monte Cristo, in western Hidalgo County, in the Rio Grande Valley. Location is on Hargrave's Jackson lease, in Block 97, Valley Farms Subdivision.

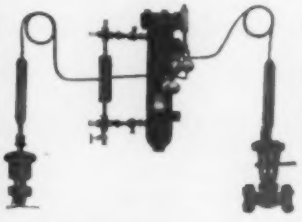
W. C. Fatjo Drilling Co., Lafayette, La., is under contract to Tidewater Oil Co. for a 6,100-ft. test in the Cankton area, at the south tip of St. Landry Parish, South Louisiana. It will be Tidewater's 2 Guidry, in 24-8s-3e.

Crow Drilling & Producing Co., Shreveport, is on a new wildcat operation in Claiborne Parish, North Louisiana, as a contract job for David Crow, acting as trustee. It is a 4,000-ft. Paluxy test at 1 Kimbell, in 29-20n-7w, about 5 miles northwest of Athens. Location is about 2 miles west of Athens field.

Crawford Drilling Co., Shreveport, is under contract to Ohio Oil Co. for another deep test in the Theall area, in Vermilion Parish, Coastal Louisiana. Plans call for drilling to 11,900 ft. Designation is 1 Walter Durke, with location in 36-13s-2e. This is Crawford's fourth job in the area. The first test, completed early in 1956, and the second, last October, got gas and condensate production in a 11,500-ft. sand. The third test, completed this month, was dry at 12,750 ft.

ACCIDENTS

don't just happen— they are CAUSED!



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NOW AVAILABLE – *Technical paper "A Method for Neutron Derived Porosity Determination for Thin Beds". Write McCullough Tool Company, 5820 South Alameda St., Los Angeles 58, California.*

McCullough Log Enables Precision Perforating of 5' Pay Zone

Discovers 8' Error in Electric Log and Casing Measurements

Operator of this old well ran an electric log which located a new, possibly productive, 5' sand.

McCullough was then called to run a Neutron Log. The Neutron curve confirmed the productive possibilities of the new zone, but also discovered that both the electric log and casing measurements were 8' in error.

The well was plugged back to 6800' and perforated according to McCullough measurements.

Thirty ½" improved Ogival Bullets were shot in the 5' sand in one run by a 3½" O.D. McCullough M-3 Gun. Casing was 5½" O.D. 17 lb.

The well started flowing through the casing before the M-3 Gun was out of the hole.

If the McCullough Radiation Well Logger had not discovered the 8' measurement error, the 30 shots would have missed the pay zone entirely.

It always pays to rely on the accuracy and dependability of McCullough's Radiation Well Logger.

McCullough Log Locates and Defines 11 New Pay Zones

Accuracy of McCullough Radiation Well Logger Permits Sharp Shooting of 11 Thin Zones for 138 B/D Increased Production

This was an old well in an established California oil field. Production had fallen to five barrels of oil per day.

Believing better production was possible, the operator decided to log and re-perforate the well. McCullough's combination Gamma Ray-Neutron Log was run from 4380' to 5645', locating several small, promising stringers of untried sands above the original pay zones.

A simultaneous collar log accurately located casing collars in relation to these thin sands, thus assuring "pin-point" accuracy in perforating.

The two original producing sands were re-shot, four holes per foot, with 26 improved ½" Ogival Bullets from McCullough M-3 Guns and with 26 McCullough Standard Casing Glass Jets.

Above these zones were the 11 small sand stringers ranging in thickness from 4 feet to 13 feet. Intermediate zones, lying between the productive sands, which were not to be perforated ranged in thickness from 5 feet to 103 feet.

Accurate measurement means "putting the shots where they count"... and the "pin-point" accuracy of the McCullough Radiation Well Logger makes sharp shooting of thin zones practical... assures uniform perforating coverage of any zone, thick or thin.

The 11 pay sands were perforated with 256 shots, four holes per foot, by 3½" O.D. McCullough M-3 Perforators firing ½" Ogival Bullets. Production increased from 5 to 143 barrels of oil per day.

This is only one of many actual jobs where the accurate, reliable, easily interpreted information provided by the McCullough Radiation Well Logger has located and defined multiple pay zones, tied-in casing collar locations and permitted precision perforating for best possible production.

McCullough® TOOL COMPANY

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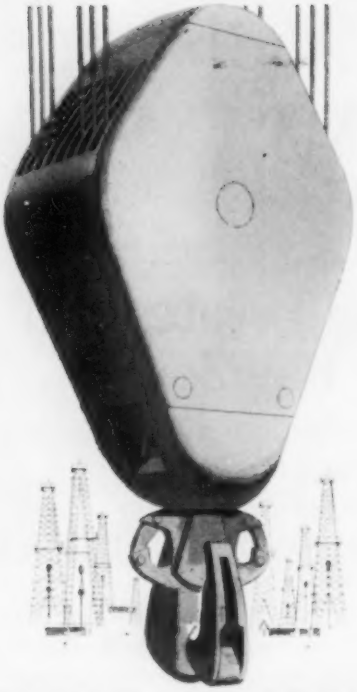

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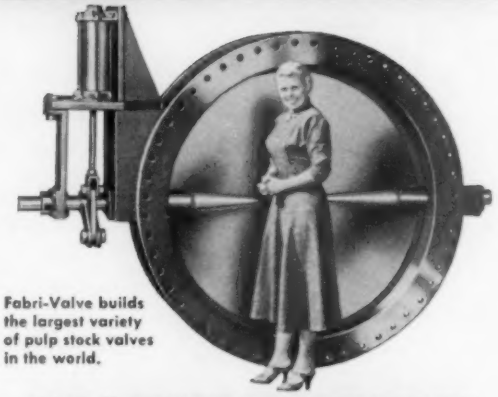

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60" BUTTERFLY

Another modern valve for modern industry designed and custom-made for a specific job. This 60" Butterfly made of type 316 stainless steel is rubber-lined and gas-tight. The angle seat is hydraulically operated. This valve is to be used in sulphite recovery and will be installed over the blow pit.

This is another example of Fabri-Valve versatility in valve fabrication. Other Fabri-Valves are available in stainless steel, monel, nickel or any combination to meet your need in sizes from 2" up. All Fabri-Valves cost less ... weigh less ... and, of course, are cheaper to ship and install.

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SOUTHERN CORP.	Charleston, S. C.

SHOWCASE...

NEW EQUIPMENT

Gravity Meter Eases Surveys in Marshes

After several months of testing and field service, this new remote-controlled tripod gravity meter is available. Labeled the Marsh Meter, the instrument surpasses manually operated AG-1 land gravity meter's accuracy.

It bridges the gap between land and marine gravity surveys where there is marsh, mud, and shallow-water areas to cover. Since it is portable, the unit may be transported by any means large enough to carry the desired tripod.

Remote control and indication of functions are achieved through the use of electrical circuits and up to 120 ft. of control cable. Powered by a 12-volt storage battery, the meter may be continuously operated for 2 days before recharging.

Manipulation and metering functions are conveniently located at the control unit, a stainless-steel waterproof box weighing about 35 lb. The control unit provides remote leveling, level indicating, remote dialing and arrestment, gravity null indication, and integration.

The meter proper has a control head housed in aluminum. Sealed against rain and water splash, the control head contains the leveling, dialing and arrestment motor. It may be removed at will to convert the meter to a land tripod model.

This wide range enhances the reading ability over normal marsh and mud movements. **Write or call: North American Geophysical Co., 3601 W. Alabama, Houston, Tex., for more information on Marsh meter.**

Utility Loader Extends Tractor Use

The features incorporated in this newly designed Kaw utility loader for tractors include a 10-cu. ft. roll-back bucket actuated by twin, 2-in., double-acting cylinders. The 2½-in.-bore lifting cylinders will hoist 1,250 lb. to a 9-ft. dumping height.

The hydraulic system comprises an 11-gal. crankshaft-driven pump and permanent piping with 1,000-psi by-pass protection. The controls are a fingertip type, located at the right of the steering wheel.

The loader's operating cycle is 5 seconds to the full dumping height and 3 seconds to the down position. Because of its simple, two-pin installation, the loader can be useful in applications where a tractor is frequently used with other attachments. **Write or call: Shawnee Manufacturing Co., 1947 N. Topeka Avenue, Topeka, Kans., for more information on Kaw utility loader.**

●

Rigid PVC Pipe Comes in Sizes to 6 in.

The standard pipe sizes of this Easton rigid unplasticized PVC pipe

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to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

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LANDMARKS of the OIL FIELDS

Every rutted road in the oil fields seems to pass beside a TYSCO installation sooner or later — perhaps it will be a vertical, horizontal, or spherical separator, a series of steel tanks, an emulsion treater, volume or indirect heater, water knockout unit, or some other type of production equipment displaying the oval TYSCO emblem.

It's true that these TYSON SMITH CO. products are often landmarks of the oil field, but they're also hallmarks . . . of engineering quality, reliability, and design efficiency.

Wherever that TYSCO emblem appears, on a steel vessel or on a service engineer's car, it stands for quality. Remember it when your next producer is flowing, and specify TYSCO!

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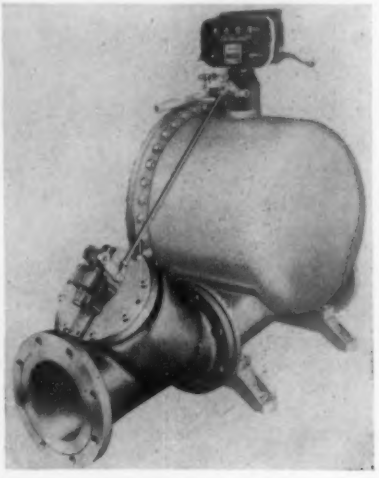
now range from ¼ to 6 in. Its resistance to chemical and electrolytic corrosion and its immunity to attack by sour crudes and salt water make it suited for pipelines, gathering lines, salt-water disposal lines, and numerous offshore uses.

Easily worked and assembled, the pipe can be sawed, threaded, welded, cemented, machined, and formed with conventional equipment. Its weight is half that of aluminum and one-sixth that of steel. Yet it has high structural strength and a tensile strength of 5,500 to 7,000 psi. **Write or call: Easton Plastic Products Co., Inc., Easton, Pa., for more information on rigid unplasticized PVC pipe.**

●



Control Valve Extends Range of Birotor Meters

The addition of 6 and 8-in. sizes makes this Brodie Quantrol valve available for the full-size range of the Brodie birotor meter—2 to 18-in. with capacities from 100 to 1,300 g.p.m. and working pressures to 150 psi. When equipped with the valve, the meter provides regulated, cushioned valve closing, preventing shock damage to pumps, piping, and other equipment, the maker states. The meter counter actuates the valve closing and decelerates flow to a smooth shutoff at any desired preset gallonage.

Valve sizes up to 4 in. are normally available in cast iron. But they can be obtained in steel. The 6 and 8-in. sizes are available only in steel.

In addition to being available as a complete unit for new meter installations, the valve is available in kit form for converting existing Brodie birotor meters to automatic quantity-control units.

The meter and valve assembly can be used for handling crude and refined

SHOWCASE . . .

New Equipment

petroleum products and other special fluids in operations covering processing, transportation, storage, blending, and delivery. **Write or call: Ralph N. Brodie Co., Alvarado and West 137th Avenue, San Leandro, Calif., for more information on Quantrol valve.**

●

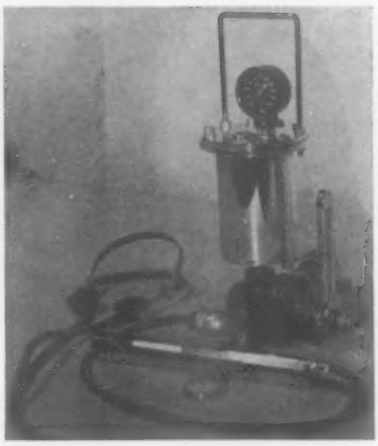
Metering Vessel Measures 300 to 4,000 Bbl. Per Day

A new model of the Vol-U-Meter oil and water-metering vessel is now in production. It is named the Model FV to distinguish it from the Model CV. The essential differences between the two units are the shape of the vessel and the type of liquid-level controls used.

The new FV unit has a reduced-diameter neck at the top and bottom to enchance metering accuracy. The Model CV uses a cylindrical vessel for comparable accuracy.

The FV unit has two liquid-level-control pilots—one at the upper dumping level. The CV unit has only one. It is located in the center of the dumping range. Providing accurately metered produced volumes, the FV unit offers an opportunity to increase the efficiency of production handling. It can also lower operating costs and cut maintenance.

It is available in working pressures ranging from 125 to 2,400 psi. with dump volumes ranging from ¼ to 10 bbl. per dump, providing rated capacities of 300 to 4,000 bbl. per day. **Write or call Oil Metering & Processing Equipment Corp., 4843 Yale Street, Houston 18, for more information on the Model FV Vol-U-Meter.**



Fluid Level in Well Is Measured in Five Minutes

A new fluid-level measuring instrument is called the Fluid Log. It features simplicity of operation, portability, and accuracy. It has been field tested.

The Fluid Log is nonelectrical. It operates by measuring the time required for a pressure pulse to travel down a well annulus to the top of the fluid and be reflected back to the surface. An accurate method of calibration is provided for the gas and pressure conditions of each well.

A field man can make complete operation, including calibration, measurement with the Fluid Log, and determination of well depth, in less than 5 minutes. This includes any well which has pressures from a few ounces to 250 psi., or a vacuum. **Write or call Nu.Tec Mfg. Co., 5520 Alhambra Avenue, Los Angeles 32, Calif., for more information on the Fluid Log.**

●

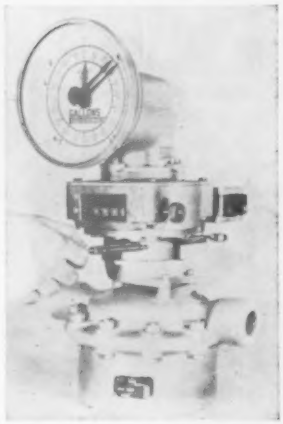
Hydraulic Control Pilot Used for Diaphragm Valves

Here's a new pilot control valve for use with diaphragm-actuated regulating valves. Responding to small variations in controlled pressures in the flow line, it readjusts the main regulator for precise throttling of the steam, gas, or liquid flow.

A positive mechanical device, the pilot is designed to eliminate wasteful leakoff of hydraulic fluid while still retaining sensitive control of the diaphragm control valve. Simple and rugged in construction, the unit consists basically of a two-way valve, actuated by a diaphragm opposed by a loading spring.

The adjustable pressure range is broad, and desired settings are easily adjusted. The controlled pressure ranges are: 3 to 15, 10 to 40, and 25 to 100 psi. A minimum operating pressure of 30 psi. is required. The valve is fitted with pressure gages to indicate the inlet hydraulic pressure and load-line pressure to the diaphragm-operated regulating valve being controlled. **Write or call: Atlas Valve Co., 280 South Street, Newark, N. J., for more information on No. 811 pilot.**

●



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No exposure to elements
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Save the money you are now spending for gauge repairs
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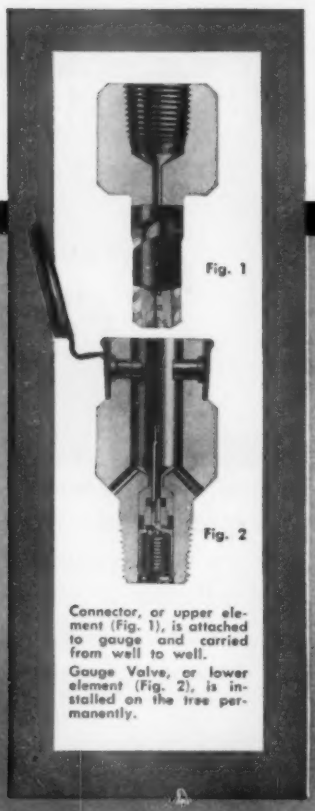
How to make ONE Christmas tree gauge do the work of MANY



Connector, or upper element (Fig. 1), is attached to gauge and carried from well to well.

Gauge Valve, or lower element (Fig. 2), is installed on the tree permanently.

U. S. Patent No. 2,618,978

GAUGE VALVE AND CONNECTOR, THE MODERN, ECONOMICAL WAY TO OBTAIN ACCURATE WELL PRESSURES

Instead of one, two, or more pressure gauges to the tree, now all you need is **one gauge per gauger.** Where you would ordinarily install a gauge and valve, simply install a Thornhill-Craver Gauge Valve (Fig. 2). To obtain a pressure reading, just insert a calibrated gauge with Connector (Fig. 1) in the Gauge Valve. Half a turn engages a J-Tool and opens the valve, exposing the gauge to well pressure. Remove the gauge and the valve closes automatically. Since a single gauge is used for any number of wells, that gauge may be checked and calibrated frequently to insure accurate pressure readings for all wells.
No gauge inventory. No breakage. No replacements. No repairs. Safe and easy to use. Stainless steel throughout.

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metering a step further toward complete automation. The system provides for automatic-switch control for all pumps and quantity-control valves at the meter. Upon completion of a predetermined liquid delivery, a switch is automatically thrown, opening an electrical circuit and cutting off simultaneously all liquid flow at the meter and all pumping action.

The system includes a new accessory control switch, a predetermining register, latch box, and quantity-control valve—all installed at the meter.

Where repeated deliveries of a fixed amount of liquid are required, a special factory-set predetermining register is available. This saves time on fixed-volume deliveries to barrels and mixing tanks by eliminating resetting of the register after each run. **Write or call Rockwell Mfg. Co., 400 North Lexington Avenue, Pittsburgh 8, Pa., for Control System Bulletin No. OG-327.**

●

Pressure Gage Protects Workers From Pressure

This Weksler safety gage is designed to protect observers from damage should the bourdon tube burst due to excessive pressure, corrosion, or other damaging conditions. In addition, the gage's internal mechanism is easy to get to for repairs, inspection, cleaning, or recalibration, the maker states.

An integrally cast solid-metal wall separates the internal mechanism from the dial. And three bosses on the mounting flange allow a ⅜-in.-space between the blowout plate and the wall or panel.

A metal plate and gasket seals the back of the case. These are held in place by a spring mechanism attached to the internal side of the case. Should the bourbon tube rupture, this mechanism allows the back plate to open, releasing pressure without the plate becoming detached from the instrument.

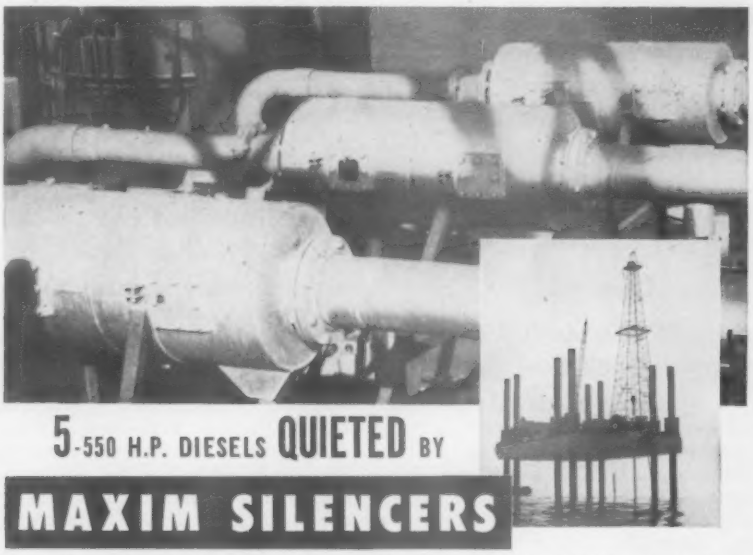
Housed in a cast-aluminum case with screw bezels and a back flange, the gage is adaptable for either wall, flush, or direct mounting. It comes in 4½, 6, and 8½-in. dial sizes in pressure ranges to 10,000 psi. **Write or call: Weksler Thermometer Corp., 195 East Merrick Road, Freeport, Long Island, N. Y., for more information on the safety gage.**

●

Pressuring Tool Helps Eliminate Casing Failures

Here's a new tool that allows casing to be pressure tested before cementing, the maker reports. In operation, a drillable ring seal is placed down the float collar or shoe, and casing is run and circulated in the usual manner. Then a plug is dropped immediately previous to running cement. The plug seats in the ring seal and allows the casing to be pressure tested.

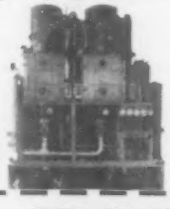
If a fault is apparent, the casing is tested out of the hole and the bad joint replaced. When no fault is apparent, the plug is retrieved with the



5-550 H.P. DIESELS QUIETED BY
MAXIM SILENCERS
for Pacific Driller #1

Capable of 20,000 ft. depths. Owner: Offshore Construction Inc. Drilling Contractor: Sun Marine Drilling Corp.

Maxim Silencers were the choice for all five of the 550 H.P. Caterpillar Diesels on Pacific Driller No. 1. Maxim exhaust and intake silencers, backed by Maxim engineering service, have been first choice throughout the oil industry for many years, for pumping stations, for field rigs, wherever power is used.



MAXIM EVAPORATORS—ANOTHER VITAL AID TO OFFSHORE DRILLING

Maxim offers the practical way to supply fresh water needs with compact, efficient Maxim Evaporators . . . operating on steam, vapor compression or engine waste heat.

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Subsidiary of Emhart Manufacturing Company
98 Homestead Ave., Hartford, Conn.
Gentlemen: Please send bulletins for: SILENCERS ☐ EVAPORATORS ☐

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SHOWCASE . . .

New Equipment

sandline and cementing operations are carried out immediately. **Write or call: Macro, Ltd., 10815, 85 Avenue, Edmonton, Alta., Canada, for more information on precement pressuring tool.**

●

Portable Auger Eases Hole Digging, Soil Sampling

Digging holes for fences along right-of-ways and around plants and production equipment can be made fast, easy, and simple with this new post-hole auger and its attachments, according to the manufacturer. Because it is lightweight, one man can do the complete hole-digging operation.

Running at high speed, the auger cuts a clean hole without the operator having to apply strenuous pressure on it. And since the hole is cut clean, the operator can easily lift the auger out.

The auger moves the soil from the hole regardless of the type of soil. Too, wet sticky clay will not stick or clog the auger, the maker states.

A remote throttle and centrifugal clutch gives the operator instant control over starting and stopping of the auger. Should the auger be stopped suddenly by hidden objects, it causes little strain on the operator.

The auger is powered by a Clinton two-stroke-cycle air-cooled engine mounted on rubber cushions to eliminate vibration. The straps are made of heavy-duty webbing and the back rest is foam-rubber padded. Both can be quickly adjusted for comfortable operation. **Write or call: Haynes Mfg. Co., Livingston, Tex., for more information on the Little Beaver post-hole auger.**

●

Data-Processing System Features Built-In Logic

This new Beckman 112 industrial data-processing system is capable of computing and logging such secondary operating guides for industrial processes as the carbon-burning rate, a critical operating factor in the catalytic cracking of petroleum. Such secondary operating guides are often the controlling element in the safe and economical operation of a process. Often they cannot be measured directly. Instead, they require that operating personnel make calculations to obtain them, even when automatic logging devices are used.

This instrument is designed to make such computations continuously and automatically. And it is accomplished without the use of an expensive computer by incorporating simplified transistorized logic circuits in the data system, states the maker.

The principal component of the instrument is a Beckman CADC computing analog-to-digital converter, capable of handling hundreds of channels of incoming information from thermocouples, pressure gages, stream-analysis instruments, etc.

In the form of electrical signals, this data is automatically sorted, stored, and converted to digital numbers or combined in complex mathematical formulas. The output in every case is in the form of simple numbers, accurate to three figures. **Write or call: Beckman Instruments, Inc., 2500 Fullerton Road, Fullerton, Calif., for more information on the 112 data-processing system.**

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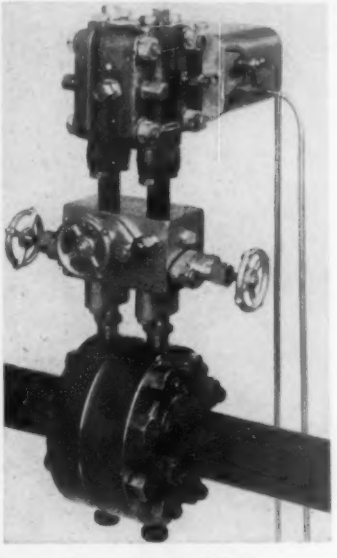


Three-Valve Manifold Uses Little Space

Little pipe alleyway space is required for this new three-valve manifold. And it can be used with all makes of pneumatic or electric differential-pressure flow transmitters. It extends only 5½ in. from the edge of the orifice flanges.

The self-supporting steel body is rated at 1,600 psi. at 350° F. But higher ratings are available. The body contains two full-opening gate valves and one needle bypass valve. This compact design permits venting or draining in any position for gas or liquid service. Its separate ½-in. connections permit purging and sealing simultaneously on corrosive or wet services.

Ruggedly constructed, the manifold

(Continued on page 178)

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of Feb. 25, 1957

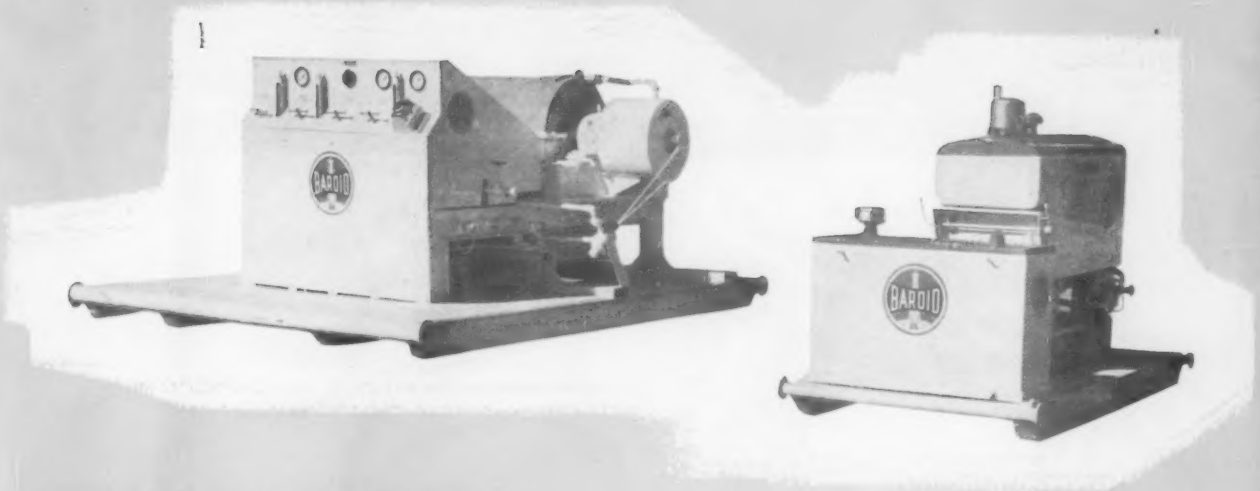
NAME..... TITLE.....

COMPANY.....

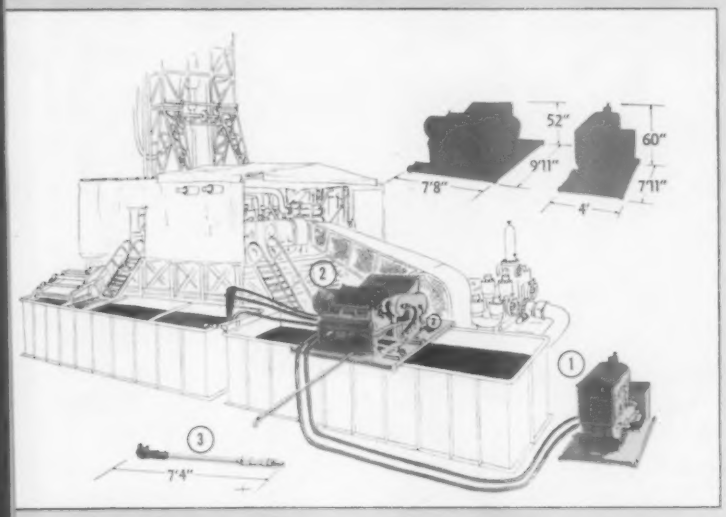
ADDRESS.....

CITY..... STATE.....

DATE.....



BAROID'S new mud centrifuge



Simple and trouble-free, the Baroid Centrifuge consists of three units: (1) a skid mounted engine and hydraulic pump to furnish power, (2) the skid mounted centrifuge, and (3) the portable mud pump. The Baroid Centrifuge operates on gasoline, natural gas or butane. If requested, a diesel engine can be furnished with the power unit. It requires no electrical equipment, and safety features are included to prevent damage to equipment by loss of coolant or overloading. Use it also to reclaim discarded weight materials, as a desander, or to remove gas from gas-cut muds.

CUTS YOUR MUD COSTS BY:

- **The efficient recovery of valuable mud materials**
- **The rejection of unwanted solids**
- **Better control of viscosity, gel, filtration rate, and cake thickness**

Installations on the Gulf Coast have shown the Baroid Centrifuge can save up to *four times* its daily cost through reduction of expense for weight materials.

Mounted at your mud tank or pit, the new Baroid Centrifuge discards drilled solids and fluids from valuable mud weight materials. Clays are the reason for needing chemical treatment, and the Baroid Centrifuge reduces this need by getting rid of the clays. The Baroid Centrifuge handles up to 35 barrels of mud per hour.

You gain better control of viscosity, gel strength, filtration rate, weight, and cake thickness by use of the Baroid Centrifuge. It reduces water dilution needs, handles lost circulation materials, and aids in removing soluble contaminants or spent chemicals.

Weight material recovery efficiency of as high as 99% and clay rejection of as high as 60% have been achieved on one pass of the mud through the Baroid Centrifuge! Write for complete data and specifications.

BAROID

BAROID DIVISION • NATIONAL LEAD CO.
Main Office: P. O. Box 1675, Houston 1, Texas

5710

BAROID DIVISION • NATIONAL LEAD CO
Main Office: P. O. Box 1675, Houston 1, Texas

Gentlemen: Please send me data on the Baroid Centrifuge.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

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TUNGSTEN CARBIDE SEATS and BALLS

Manufactured from sintered tungsten carbide, the hardest, most wear-resisting metal known to the industry. These seats and balls will not cut from fluid wash when subjected to extreme pressures—will not wear from the abrasive action of sand—will not hammer out from extreme fluid pound—will not pit from action of corrosive well fluid.

The Oilmaster tungsten carbide ball and tungsten carbide seat combination is the closest approach to a perfect pump valve that has ever been built. While it is not an indestructible valve unit, countless installations have proved that carbide valves consistently permit pumps operating under adverse conditions to run a year or longer, where other valves, regardless of the material used, almost invariably cut out in sixty or ninety days.

Compare the cost of pulling a well with the the cost of the finest seat and ball you can put in a pump. If the pulling cost looks high—specify Oilmaster Carbide seats and balls in all of your pumps.

FLUID PACKED PUMP CO.

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Los Nietos, California.

Distributed by the National Supply Co., Pittsburgh, Pa. Export: The National Supply Co., Export Division, 600 Fifth Ave., New York • Co-Distributors: Union Supply Company, Beacon Supply Co., Industrial Supply Co.

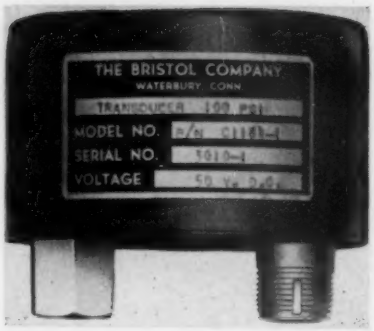
If valve failures are causing your pulling jobs...specify Oilmaster Tungsten Carbide Seats and Balls

SHOWCASE . . .

New Equipment

provides a standard assembly for all services. It has separate purge connections, is easy to install and maintain, and allows a fast and thorough checkout of the complete assembly during turnarounds.

Special materials are available for corrosive services. **Write or call: Instrument Manifolds Co., 3174 E 22nd. Street, Tulsa, Okla., for more information on three-valve manifolds.**



troublesome handling job made inexpensive with a

BRADEN WINCH

One man and a BRADEN Winch can do many jobs that might ordinarily require a crew of workers. The handling work a BRADEN Winch can do is limited only by the imagination of the operator.

BRADEN models are made for handling any load up to 100,000 pounds, with safety. So to save time and money, specify a BRADEN Winch for any handling job.

write for complete catalog

BRADEN WINCH COMPANY
P. O. Box 547, Broken Arrow, Oklahoma

BRADEN Winches

Pressure Transducer Operates With Variety of Fluids

This new Bristol pressure transducer is designed for reliable and accurate service with a wide variety of fluids, including both jet and piston-engine fuels, lubricating and hydraulic oils, air, carbon dioxide, and oxygen. Its output signals may be either linear or to any desired curve, as required for actuating the appropriate control or measuring system.

Normally the transducer will be available in pressure ranges from 0 to 2 psi. to 0 to 250 psi., but other ranges can be obtained. It will be offered with potentiometer cards in resistance ranges from 0 to 2,000 ohms to 0 to 20,000 ohms. The current rating of a typical potentiometer is 10 ma. at 5,200 ohms.

The transducer is fitted with either standard three-pin connector-plug terminals and ⅛-in. A.N.P.T. or 7/16-in., 20N.F.3 pressure fittings. And it is hermetically sealed. All materials have been selected for galvanic similarity.

The transducer's over-all length is 2⅞ in., its diameter is 2⅞ in., and its weight is 6 oz. **Write or call: Bristol Co., Waterbury 20, Conn., for more information on pressure transducer.**

•

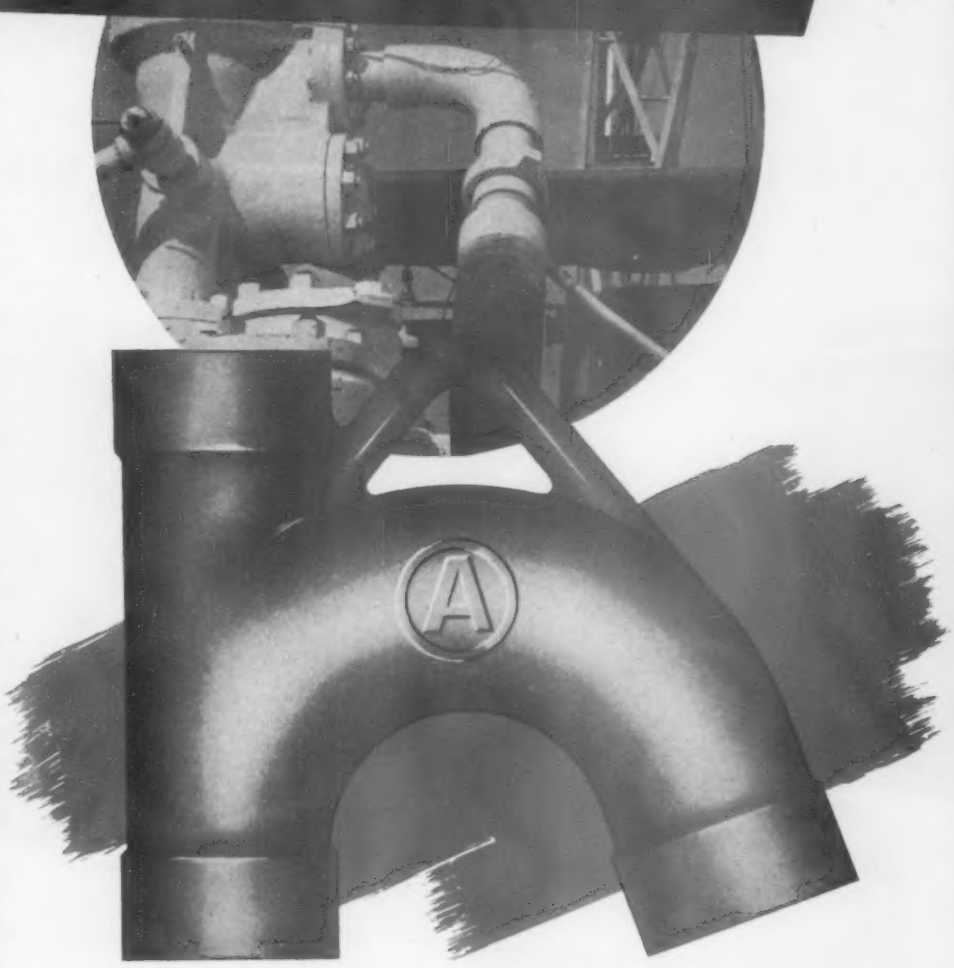
Bottom-Hole Injector Designed to Cut Costs

Greater protection for the internal surface of both oil and gas-well tubing is offered by this new bottom-hole chemical injector, the maker reports. And it may reduce chemical-treating costs and eliminate hazards to field personnel involved in the use of lubricators. The injector is easy to operate and the well need be shut in only a few minutes for treatment.

The injector can be used in flowing gas and oil wells and also gas-lift wells on constant flow. The maker especially recommends it for flowing wells set on a packer where the chemical has to be injected into the tubing at the surface. But it is expected to prove valuable on wells without packers, where the chemical is injected down the annulus.

The over-all length of the injector for use in 2-in. tubing, is 13 ft. Its maximum o.d. is 1.667 in. and its reservoir capacity is 1 gal. The capacity of the pump chamber can be varied from 1 pt. to 1 qt. by changing the length of the piston rod. The pump will normally be supplied with a piston-rod length set to give 1-pt. injections. **Write or call: Eddie Jones Engineering Co., P. O. Box 107, Pettus, Tex., for more information on bottom-hole chemical injector.**

FOR HIGH PRESSURES



AMERICAN IRON STANDPIPE & MANIFOLD FITTINGS

Mudline problems are quickly solved with American Iron fittings available in a variety of versatile designs. Adaptable to manifolds of any construction, these high-test fittings are manufactured in the welded type or with standard threaded connections.

Available Through Your Supply Store

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PETROLEUM EQUIPMENT

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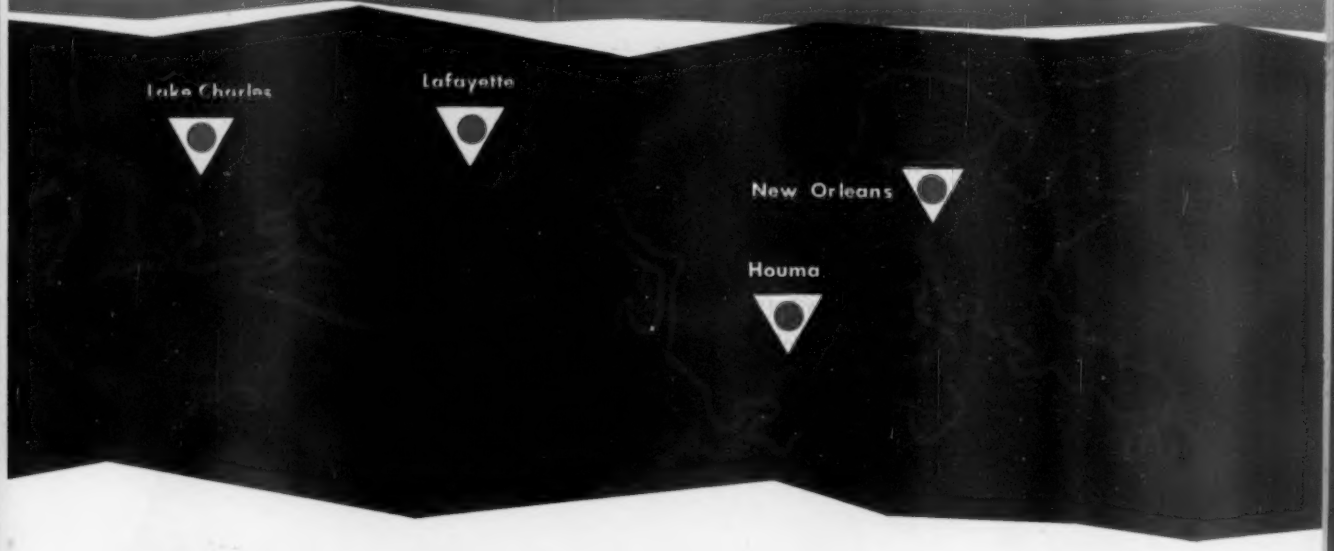
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

Magcobar now provides an

EXCLUSIVE LOUISIANA OFFSHORE DIVISION . . .



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Magcobar now has mud engineers stationed in four strategic locations along the Louisana Gulf Coast whose only job is to service offshore rigs. These men are offshore specialists—they know your problems and how to solve them. On offshore locations, as on any location on the North American Continent, when you want the best mud products and the best mud service—Call MAGCOBAR.

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Houston, Texas

Magcobar
Complete
DRILLING MUD SERVICE

OIL AND GAS JOURNAL

Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Corrosion Inhibitors. Quaternary ammonium salts for use as corrosion inhibitors and bactericides in secondary oil recovery are the subject of this 16-page booklet. The new booklet outlines the chemical and physical characteristics of the cationic surface-active agents along with their applications and formulations. Described as wetting, sanitizing and emulsifying agents, the salts may be water soluble, oil soluble, or water dispersible, depending on their composition. **Write or call: Armour & Co., Chemical Div., 1355 W. 31st Street, Chicago 9, Ill., for the booklet, Quaternary Ammonium Salts.**

●

Cooling Equipment is the subject of this new booklet. It describes a line of air-cooled refrigerating equipment available in sizes from 1 to 10 hp. The booklet furnishes technical data on: (1) an air-cooled refrigerated water chiller, (2) an air-cooled refrigerated liquid chiller, (3) a heat exchanger, (4) a water-temperature regulating valve, and (5) an automatic heating control. It also discusses the respective merits of small air-operated cooling units and other cooling methods. **Write or call: Vic Manufacturing Co., 1313 Hawthorne Avenue, Minneapolis 3, Minn., for cooling equipment booklet.**

●

Nickel-Cadmium Storage Batteries. Here's an eight-page technical report that was prepared to help engineers evaluate the practicability of miniature nickel-cadmium batteries for switchgear, diesel-engine starting, and portable electrical equipment. Describing high-ouput sintered-plate nickel-cadmium storage batteries, the technical report furnishes the details of development, construction, and operation along with curves of discharge and charge characteristics. **Write or call: Nickel Cadmium Battery Corp., Easthampton, Mass., for technical report on nickel-cadmium batteries.**

●

Gas Liquefier, a compact, single cylinder water-cooled unit, is illustrated and explained in this new six-page folder. Photos and drawings show the machine's operating cycle and construction. The technical data covers speed, efficiency, yield, motor characteristics, cooling-water consumption, weight, and size. Including information on liquid-air applications, the folder covers the economics, and practicability of an in-plant source of liquid air when temperatures as low as —328° F. must be produced. **Write or call: North American Philips Co., Inc., 750 South Fulton Avenue, Mount Vernon, N. Y., for folder on gas liquefier.**

●

Thermometers and Hydrometers Booklet. This new 24-page booklet contains a complete listing of A.S.T.M. general and specific-purpose thermometers and hydrometers for industrial measurement of temperature and specific gravity. The A.S.T.M. thermometers are listed by number and test. Illustrating many of the items, the booklet supplies complete specifications and prices. It also supplies directions for reuniting mercury in thermometers, general facts about hydrometers and their use, suggestions for assuring accurate hydrometer readings, and other helpful information. **Write or call: Central Scientific Co., 1700 Irving Road, Chicago, Ill., for Bulletin 40.**

Adapters for Tube Fittings. New 12-page Catalog 4360 shows straight thread plugs and adapters, O-rings for straight thread fittings, and steel and brass pipe fittings. Already punched for filing, the catalog illustrates each of the products and lists its specifications and parts number, making it convenient for the reader to quickly select the particular product to suit his needs. **Write or call: Tube & Hose Fittings Div., Parker Appliance Co. 17325 Euclid Avenue, Cleveland 12, Ohio, for Catalog 4360.**

●

Bit and Rod-Shop Equipment for fast bit reconditioning is pictured and explained in this new eight-page bulletin. The bulletin covers jackbit, bench, and shank grinders; drill-steel cutters, bit-furnaces, and steel sharpeners and lists the equipment specifications. **Write or call: Ingersoll-Rand, 11 Broadway, New York 4, for Form 4187.**

●

Refractometers for Process Control. New eight-page Bulletin R 1000 describes eight new refractometers for use in laboratory, pilot plant, and process-control applications. The bulletin also illustrates and describes the operation of the optical servo system used.

Harrisburg Flanges and Couplings

-- without a doubt

There is no doubt in the minds of users as to the performance of Harrisburg Flanges and Couplings in the Petroleum Industry. The many millions in use indicate the universal confidence of our customers.

Harrisburg Drop-Forged Pipe Flanges are made to A.S.A. Specifications, in threaded, butt-welding, slip-on welding, Van Stone and blind types. Closely controlled analysis, accurate machining and rigid inspection standards insure uniformly high quality flanges for oil field, utility and industrial uses.

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And it lists applications, sensitivities, ranges, and other important engineering data pertaining to the design and use of refractometers in chemical and petroleum processing. **Write or call: Phoenix Precision Instrument Co., 3803-05 North Fifth Street, Philadelphia 40, Pa., for Bulletin R 1000.**

●

Guide for Selecting Valves, Boiler Mountings, and Lubricating Devices. Newly revised Circular 555 (24 pages), describe gate and globe valves and PVC all-molded valves which are resistant to industrial chemicals. Tab indexed for easy reference, the booklet furnishes complete specifications and other helpful information on the selection of valves, boiler mountings, and lubricating devices. **Write or call: Lunkenheimer Co., Box 360, Annex Station, Cincinnati 14, Ohio, for Circular 555.**

●

Bulk Storage-Tank equipment is featured in new Catalog 66. Fifteen data sheets bound together in this loose-leaf binder furnish the specifications and illustrate the design details on petroleum storage-tank drain valves, automatic tank gages, level indicators, gage hatches, and related equipment. Most of the annotated drawings are a full page in size, clearly showing construction and operating details of the equipment. **Write or call: Wheaton Brass Works, Springfield Road, Union, N. J., for Catalog 66.**

●

Steel Tube Fittings. This new 48-page catalog supplies complete engineering data on Weatherhead 7000 and 8000 Series hydraulic flareless tube fittings and S. A. E. 37° flare (J. I. C.) hydraulic tube fittings. In addition to the engineering specifications, the catalog devotes a section to assembly instructions, materials, finishes, and operating pressures. **Write or call: Weatherhead Co., 128 West Washington Boulevard, Fort Wayne, Ind., for steel-tube-fittings catalog.**

●

Portable Valve-Seat Grinder for large industrial engines with valve seats measuring 3¼ to 12 in. o.d. is the subject of this new four-page brochure. Powered by an air motor, the unit can be safely used in gasoline plants and gas compressor stations, the brochure states. The brochure describes the grinder, charts its specifications, and illustrates it with a diagram. **Write or call: Thompson Products, Inc., 8354 Wilcox Avenue, Bell, Calif., for brochure on valve-seat grinder.**

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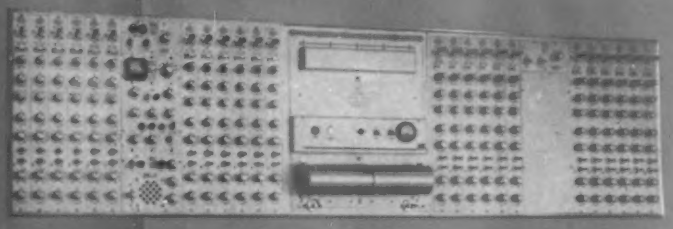
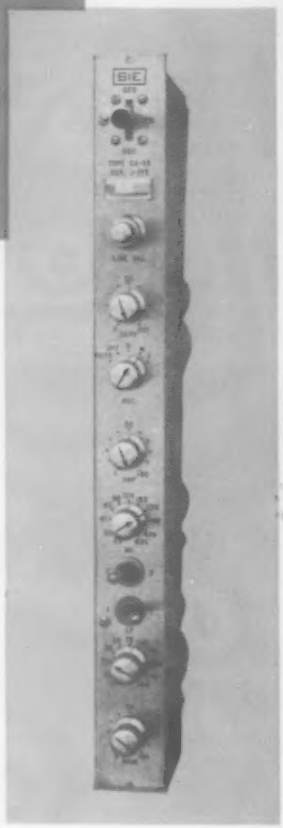
REFLECTION
HIGH FREQUENCY } **RECORDING**

with ONE seismic instrument





G-33 Full Spectrum
SEISMOGRAPH SYSTEM

SIE GA-33 Geophysical Amplifiers installed in an SIE G Series Seismograph System result in the widest range of recording applications ever offered the geophysical industry. In this small package are combined facilities for recording Refraction, Reflection, and High-Frequency seismic records . . . allowing the petroleum geophysicist to cover the entire seismic spectrum from 4 to 600 cycles-per-second with just one instrument.

Since the G-33 replaces three separate systems, it **cuts instrumentation costs in half!** In addition, SIE G-22A Seismograph Systems can be converted to Full-Spectrum operation simply by substituting plug-in GA-33 amplifiers and exchanging galvanometers . . . another example of SIE design forethought that lowers equipment costs for the industry's leading geophysical organizations.

ESSENTIAL TO A COMPLETE GEOPHYSICAL PROGRAM

Although SIE G-33 equipment exceeds any other seismograph in its capabilities and range of applications, it occupies only half the space required by many conventional single purpose instruments. With adaptability to every seismic exploration method, outstanding operating flexibility, and maximum field utility in terms of size and weight, the G-33 Full-Spectrum Seismograph System meets every requirement of modern exploration programs.

The GA-33 Geophysical Amplifier features Full-Spectrum filtering, variable AGC time-constants, and extremely low distortion (less than 1%). Its wide range is especially useful in magnetic recording applications, while plug-in construction permits simple installation and easy maintenance.

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EQUIPMENT MEN . . . in the News

Parkersburg Creates Five New Divisions

J. W. ROBBINS

After a series of conferences to evaluate means by which better and expanded services could be offered to customers, President Bernard P. McDonough recently announced through A. G. Evans-Lombe, vice president and general sales manager, a reorganization of The Parkersburg Rig & Reel Co. The new alignment of duties and responsibilities has been effective since January 1, 1957.

Under the new organization plans, five separate divisions have been created. Each division is headed by a general manager who will be responsible for all activities pertaining to products in his division.

C. D. HAEHL

W. J. SLAUGHTER

Heading the five divisions are J. W. Robbins, general manager of oil-field sales division; C. D. Haehl, general manager of pressure vessel division; W. J. Slaughter, general manager of pumping unit division; J. Q. Callaway, manager of special products division; and C. L. Wilson, general manager of metal building division.

General sales offices will continue to be in Fort Worth as will headquarters for the oil-field sales division and special products division. Division offices for metal buildings, pressure vessels and pumping units will be at Parkersburg, W. Va., Houston, and Tulsa, respectively.

Slaughter also announced appointment of three regional sales managers for the pumping unit division: C. M. Ferguson, sales manager of the northern region with headquarters at Tulsa; G. W. Hendricks, sales manager of the southern region with offices at Dallas; and J. L. Norris moves to Calgary as sales manager of the Canadian region.

Haehl has appointed W. H. Land sales manager for the pressure vessel division, with headquarters in Houston. Regional sales managers named by Haehl were Ralph M. Roberts, Gulf Coast region with headquarters in Houston, and J. D. Connor, West Texas-New Mexico region, at Midland.

Robbins also announced regional

J. Q. CALLAWAY

C. L. WILSON

sales managers for the oil-field sales division: L. R. Latimer, Parkersburg, sales manager of the eastern region; J. M. Baldridge, Houston, sales manager of the Gulf Coast region; M. L. McLafferty, Tulsa, sales manager of the northern region; B. D. McClelland, Odessa, sales manager of the West Texas-New Mexico region; W. L. Spawr, Los Angeles, sales manager of the Pacific region; and W. H. Fitzer who will continue as export manager at New York.

Wilson appointed K. L. Rauth, Atlanta, Ga.; A. P. Kilborn, Dallas; and E. B. Wilkinson, Chicago, as regional sales managers. L. H. Ostrye was named assistant to the general manager of the metal building division.

General Geophysical Now Has French Affiliate

General Geophysical Co. has expanded its foreign operations by establishing a new affiliate, General Geophysical Co. de France, with headquarters in Paris. Manager of the French subsidiary is Jean Bock.

General also operates a Benequelan subsidiary with offices in Caracas. In the U. S., General has headquarters in Houston and service installations in New Orleans, La.; Denver, Colo.; Midland, Lubbock, and Dallas, Tex.; Miles City, Mont.; Casper, Wyo.; and Edmonton, Alta., Canada.

Election of Officials Announced by Otis Engineering

Robert H. McLemore has been elected president of Otis Engineering Corp., Dallas, and its subsidiary companies. H. C. Otis, president and founder, was elected to the position of chairman of the board of directors. Herbert C. Otis, Jr., formerly executive vice president and secretary of the corporation, was elected first vice president and secretary.

Otis Engineering is the parent company of Otis Pressure Control, Inc., a sales and oil-well service subsidiary.

Prior to joining Otis, McLemore was vice president and general manager of the Turbodrill division of Dresser Industries. He has also been a member of the Otis board of directors for some time.

McLemore was executive vice president and general manager and one of the founders of Welex Jet Services, Inc., Fort Worth. He began his oil-industry career 20 years ago as a petroleum engineer for the Dallas division of Sun Oil Co. As head of Welex, he directed the development and licensing of the shaped charge or jet system of perforating oil-well casing. Although he remained on the board of

Otis Engineering officials include Herbert C. Otis, Jr. (left); Robert H. McLemore; and H. C. Otis.

LEE C. MOORE

TRAILER MOUNTED MASTS

. . . transported with lines strung

A Lee C. Moore trailer mounted mast is designed so that complete mast and accessories can be transported with blocks strung . . . another reason why Lee C. Moore masts save valuable time in rigging up and tearing down operations.

SINGLE TRAILER MOUNTED MASTS

86 ft. 94 ft. 97 ft. 97 ft. Heavy duty 100 ft. 126 ft. Export model

DUAL TRAILER MOUNTED MASTS

97 ft. 100 ft. 126 ft. 126 ft. Export model

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FOREIGN LICENSED MFR. OIL WELL ENGINEERING CO., LTD., CHEADLE HEATH, STOCKPORT, ENGLAND

directors, McLemore subsequently resigned from Welex to establish a consulting practice several years ago. Among his clients were Dresser, which he joined in 1955 as director of its oil-well services division.

Otis Engineering Corp. is also the parent company of Otis Pressure Control Export, Inc., Canadian and European sales and service, and Servicio Tecnico de Pozos (Otis) C. A., South American sales and service outlet. The firm also has representatives on the East and West Coasts and in the Rocky Mountain region.

Macco Appoints Refinery, Chemical Division Head

E. Van Dornick has been appointed vice president and corporation director in charge of Macco Corp.'s refinery and chemical division.

Van Dornick has had 20 years' experience in petroleum refinery and chemical-plant design. He is a former director of engineering of the oil and gas facilities division of Arabian American Oil Co.

Dresser Manufacturing Names Hanson, Haight

Robert J. Hanson and George W. Haight have been appointed general markets sales representatives for Dresser Manufacturing Division, one of the Dresser Industries, Bradford, Pa., according to Sales Manager H. Z. Hight.

Hanson will cover the midwestern states from headquarters in Chicago. He was previously employed by Triner Scale & Manufacturing Co., Ludlow Valve Co., and Central Illinois Gas & Electric Co.

Haight will cover 12 states in the Northeast, with headquarters in New York City. He has previously been with the Rensselaer Valve Co. and the construction materials division of General Electric Co.

HOMCO Occupies New Victoria Store

Houston Oil Field Material Co., Inc., has occupied a new supply and service store in Victoria, Tex. Store manager is M. J. Phillips, and district manager is M. J. Mosher.

Sales personnel operating out of Victoria are Shelby Beard, Frank Gonzales, G. W. Harrell, Jr., E. J. Hons, Ira Kinard, George Solis, D. Russell.

Service personnel are J. W. Anderson, Rodney M. Baker, Thomas Flores, W. J. Gier, A. W. Glover, W. H. Legan, A. L. Littleton, W. H. Nolen, Red Renken, C. A. Tilley, Jr.

VERY HIGH HYDROPHILE-LIPOPHILE BALANCE VALUE...VERY EFFECTIVE IN SOLUBILIZING OIL IN WATER
WHAT'S ALL THAT MEAN?
TALKING ABOUT SEECO-MUL...BEST EMULSIFIER WE'VE EVER USED
"SEECO-MUL MAKES A GOOD MUD BETTER"
50 lbs. net
Seeco-Mul

Schlumberger Division Managers, Engineer Named

J. L. Heath has been appointed manager of Schlumberger Well Surveying Corp.'s Oklahoma division, and Charles

J. L. HEATH

C. B. EVANS

B. Evans is the new northern Rocky Mountain division manager in Billings, Mont. Guy B. Sullaway has been promoted to division sales engineer for the Texas Gulf Coast division at Houston.

Heath formerly managed the northern Rocky Mountain division. He succeeds L. A. Puzin who has been made chief engineer of overseas operations. Heath joined Schlumberger in 1947 and was manager of the Kennedy and Wichita Falls locations.

Evans previously was manager of the Sacramento and Newhall, Calif., districts and assistant manager of the Oklahoma division. Sullaway has served as field engineer and manager of several locations since joining Schlumberger in 1947.

Axelson Names Hansen Head Of Petroleum Equipment

E. M. HANSEN

E. M. Hansen has been appointed manager of the petroleum equipment division of Axelson Manufacturing Co., division of U. S. Industries, Inc. The announcement was made by James F. Beré, general manager of the company.

Beré stated that the petroleum equipment division will be set up as an integral operating unit devoted exclusively to the manufacture of petroleum production equipment.

Prior to his promotion, Hansen was manager of the Axelson sucker-rod plant in St. Louis, Mo. He joined the company in 1935 and subsequently held positions of plant engineer, production manager, and assistant plant manager. Prior to joining Axelson he served with Auto Screw Products Co. and Phillips Petroleum Co.

Welex Jet Conference Examines Outlook for 1957

Officers, division managers and their assistants, sales managers, and department heads of Welex Jet Services, Inc., Fort Worth oil-well service company, met recently at the Welex lodge and recreation center near Fort Worth in an executive sales and operations conference.

Present were R. O. Shaffer, president; J. B. Vaughan, vice president-sales; T. W. Painter, vice president-administration; O. B. Avent, vice president-operations; Johnston Murray, vice president-public relations; H. T. Jarmon, treasurer; W. D. Smith, chief engineer; L. F. Drake, assistant sales manager; F. D. Sawyer, manager of R/A logging sales; C. R. Parker, credit manager; G. C. Jefferis, Jr., manager of materials department; and J. W. Farmer, advertising manager; all of Fort Worth.

Field representatives present were J. B. Fleming, vice president and manager, Welex Gulf Coast division; J. J. Blaydes, assistant manager, Gulf Coast division; and J. W. Lyon, sales manager, Gulf Coast division, all of Houston; W. L. Carwile, Jr., vice president and manager, Oklahoma division, Tulsa; W. B. Clark, assistant manager, Oklahoma division, Oklahoma City; and

in 4 out of 5 wells you can drill better with Seeco-Mul

In almost all areas – and in 80 per cent of the wells – operators are finding that they can make hole faster and make a better well with emulsion muds. Seeco-Mul, added in quantities of 2 to 3 lbs./Bbl., effectively disperses the oil in the system which increases drilling rates, makes better hole conditions, drills into pay formations better, affords better coring, and makes a better completion. These factors are especially important in completions with low pressures and low permeabilities. Seeco-Mul is particularly recommended where water muds would impair the productivity or swell the sands in water-sensitive horizons.

Seeco-Mul readily emulsifies Diesel or crude oils in sodium or limed muds. It is temperature-stable, it has a low water loss at high temperatures, and any qualified mud engineer can use it without special instruction or extra equipment.

Seeco-Mul has a number of other advantages which your local mud dealer will be glad to tell you about – or write to us; we'll be glad to send you full particulars and a lab sample without obligation. Crossett Chemical Company, P. O. Box 271, Crossett, Arkansas.

faster, straighter penetration...better lubrication...lower pump pressures with Seeco-Mul DRILLING MUD EMULSIFIER

R. B. Burns, sales manager, Oklahoma division, Tulsa; W. O. Satterwhite, vice president and manager, West Texas division; R. C. Starrett, assistant manager, West Texas division; L. B. Putman, sales manager, West Texas division, all of Midland; J. H. Smith, manager, Rocky Mountain division; and F. Brown, assistant manager, Rocky Mountain division, both of Denver.

General-office department heads outlined departmental outlook for 1957 and described new tools in work, and programs and procedures to be introduced during the year. Moderator for the meeting was J. B. Vaughan.

Canfield, Pass, and Dickson Join Cathodic Protection

Ted Canfield, Ralph Pass, and Leslie Dickson have joined Cathodic Protection Service, Houston, as corrosion engineers.

Canfield is with the Tulsa office and was formerly head of the corrosion engineering department for Consolidated Gas Utilities Corp. Pass is assigned to the New Orleans office. Prior to joining Cathodic Protection he was a corrosion engineer with Southern Natural Gas Co. Dickson of the Houston office served with Public Service Co. of Colorado, specializing in cathodic protection.

Hycalog Reaches Logging Record in Mississippi

Commemorating the five-millionth foot of oil well logged by Hycalog, Inc., A. S. Zeller (left) receives a plaque from Max Bowerman, general manager of the firm. Zeller was manager of the logging unit which reached the milestone in a well being logged for California Co. Other crew members were M. S. Rowell and W. H. Peters.

Hycalog began operations in 1945 under the name of Engineering Service Co. Its original owners were J. R. Mayeaux and Dan J. Grady, now president and first vice president of Hycalog, Inc.

Oil Men Visit Halliburton Tech Lab

Bill Young, Halliburton Oil Well Cementing Co. organic chemist, is discussing sand consolidation with Allen Rowe, The Texas Co. petroleum engineer at Healdton, Okla.; Duane Smith, Magnolia petroleum engineer at Healdton; Merle Markley, Magnolia field foreman at County Line, Okla.; Kenneth Lucas, The Texas Co. petroleum engineer at Healdton; Dale Baker, Halliburton district engineer at Healdton; Homer Waggoner, Halliburton chemist at Duncan; and Morris Skalka, Magnolia petroleum engineer at Healdton. The oil men were visiting Halliburton Oil Well Cementing Co.'s technical center at Duncan, Okla., to keep abreast of stratigraphic data developed by the service company. During their stay in Duncan, they also toured Halliburton's manufacturing facilities.

Weatherford Oil Sends Seven to Training Program

Seven employes recently attended seminars and courses in Los Angeles and New York sponsored by the American Management Association. Those attending were: Lee Martin, western division manager, Nocona, Tex.; Jimmy Smith, district manager, Odessa, Tex.; Lee Mooty, district manager, Bakersfield, Calif; Miss Nadine Wells, assistant to the president, Houston, Tex.; Miss Fredda Dodd, controller, Houston; and R. C. Yates, eastern division manager, Lafayette, La.

F.W.D.'s Pernot Moves Up

L. L. PERNOT

Lloyd L. Pernot has been promoted to director of sales engineering by Four Wheel Drive Auto Co., Clintonville, Wis. He had been transport sales manager since 1951. G. F. DeCoursin, vice president-sales announced the appointment. Pernot will supervise all F. W. D. market specialists and the sales correspondence section. He will continue to direct transport-market product development.

Pernot entered the F. W. D. organization in 1932 in the machine shop. He transferred to the service repair department and became service manager in 1938. He held that position until he was made transport sales manager in 1951.

Magcobar Appoints Thomas To Export Sales Post

PHIL THOMAS

Phil Thomas has been appointed export sales representative by Magnet Cove Barium Corp., it has been announced by Jim Hewitt, export division manager.

Magcobar, Houston oil-well drilling-mud concern, recently expanded into South American and other foreign markets. Thomas, working out of the Houston office, will be responsible for contacting users of drilling mud all over the world. He will devote much of his early efforts to development of Magcobar sales in South America.

Prior to joining Magcobar, Thomas served as drilling superintendent in Ethiopia, Venezuela, and Colombia for Sinclair Petroleum Corp.

Dowell Forms New District In Four Corners Area

Dowell Incorporated has formed a new district in the Four Corners area of New Mexico, Arizona, Utah, and Colorado, it has been announced by A. C. Polk, vice president and general manager, Tulsa. The area previously had been serviced from the Farmington station. District headquarters will be opened in Farmington immediately.

R. R. Wagner, assistant district manager in the Oklahoma City district, has been named Farmington district manager. P. J. (Pete) Millar, general sales

This man is discovering new ways to make Mission Pump Parts even better

THIS MAN IS LOOKING INTO TOMORROW. He is using an oscilloscope to adjust one of the circuits that feed information from a test slush pump into a fourteen-channel recording oscillograph. Mission research men and engineers study this information in an unceasing effort to improve Mission products.

What does this mean to you? It means more hours of trouble-free performance, less down-time and lower pump operating costs.

This extensive instrumentation means that Mission knows more about pump parts performance than anyone else. That is why you can depend on Mission for the most advanced pump parts money can buy.

For performance and economy, specify *all* Mission Pump Parts. They are available through supply stores everywhere.

Nothing but the finest will bear the name of

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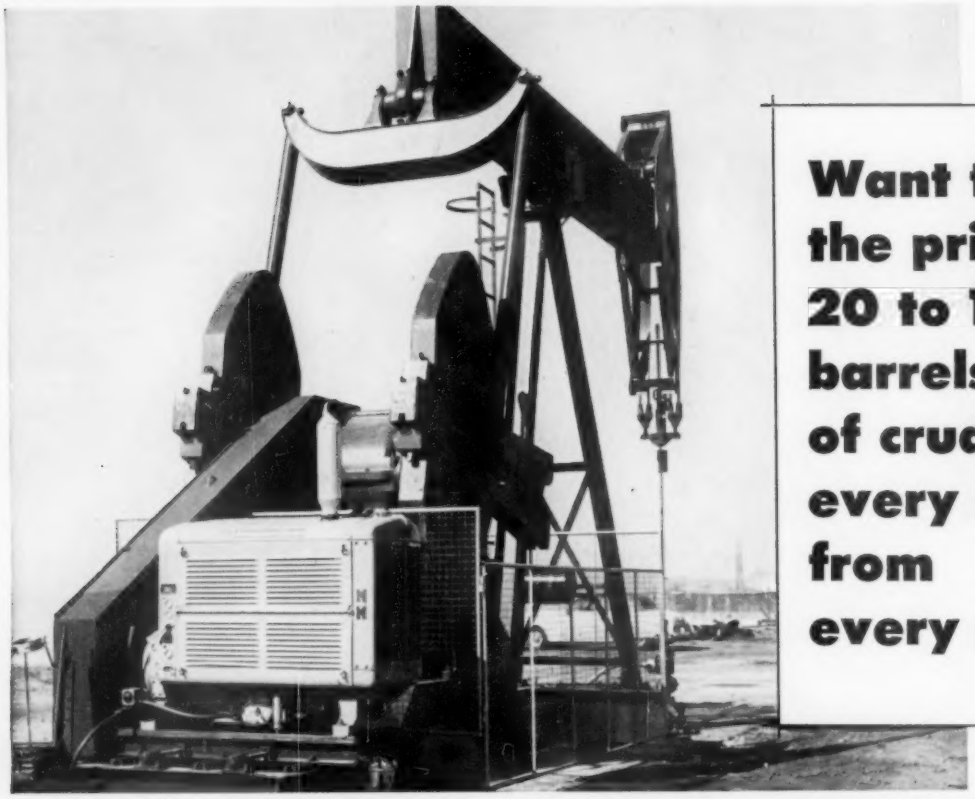

Want to save the price of 20 to 100 barrels of crude . . . every month from every well?

IF YOU PUMP EXTRA BARRELS TO PAY POWER AND STANDBY CHARGES IT'S TIME TO SWITCH TO MM GAS-FUELED ENGINES

MM 403-4A
73 BHP at 1200 rpm.
Compression ratio
8.4-1. Max. torque
335 @ 1000 rpm.

MM 605-6A
101 BHP at 1200 rpm.
Compression ratio
8.4-1. Max. torque
445 @ 800 rpm.

MM 800-6A
141 BHP at 1300 rpm.
Compression ratio
7.6-1. Max. torque
620 @ 800 rpm.

Actual cost comparisons show that producers pumping with gas-fueled engines save the equivalent of 20 to 100 barrels of crude a month over wells pumped by electric motors. At $2.00 a barrel, that's an *extra* profit *from every well* of up to *$200.00 a month!*

Figure it for yourself! Compare a natural gas cost of 15c per MCF as against an electric power rate of 1c per KWH. Compare maintenance costs established by operators on electric and natural gas installations. Your own figures will prove gas-fueled engines are the most profitable pumping power you can use!

Minneapolis-Moline long-run design helps you get the maximum in gas engine economy. Large piston displacement, moderate rpm, vacuum crankcase ventilation, thermostatically-controlled by-pass cooling, and Thermo-Clad base pans for top-to-bottom temperature control give you the all-time low in pumping costs.

Pocket the price of 20 to 100 barrels of crude—contact your MM oil field distributor. Ask for complete performance data on the nine MM natural gas engines ranging 20 to 291 hp.

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GLENDIVE

engineer, Tulsa, is district sales manager and E. A. Tulley, accounting supervisor, Tulsa, district office manager.

Wagner was a service engineer at Midland, Tex., and a maintenance engineer at Tulsa before returning to Midland as assistant district manager in 1950. Millar was promoted from service engineer at Midland to station manager at Kermit, Tex., in 1949 and in 1950 became sales engineer. He was also sales engineer and district sales engineer at Midland. Tulley started with Dowell at Tulsa in 1950 and has been supervisor of the accounts payable section since 1951.

Motorola Names Byrne Microwave Sales Manager

W. C. BYRNE

The promotion of Walter C. Byrne, Jr. to sales manager has been announced by Leonard G. Walker, marketing manager of Motorola, Inc.'s microwave and industrial control department. Byrne will be responsible for the nationwide direct sale of Motorola microwave, power line carrier, audiomultiplexing, power transmission line carrier couplers, and industrial control equipment.

Prior to his new assignment Byrne was midwestern district sales manager. With Motorola since 1950, Byrne was first a senior engineer and then a specialist in microwave and industrial control products.

Totco to Expand Marketing In Canada, Names Young

J. HARRY YOUNG

H. H. (Pete) Peters, president of Technical Oil Tool Corp., has announced an expanded marketing program for Totco in Canada. Totco recorders will be available not only for sale but also on a rental basis throughout Canada. The eight supply stores of the Oil Well Supply Division of United States Steel Corp. will now carry complete stocks of Totco equipment for daily and term rental.

To coordinate this broadened Canadian activity, Totco has employed J. Harry Young, who will make his headquarters in Calgary, Alta.

National Supply Names San Joaquin District Mgr.

J. M. DAVIES

James M. Davies has been appointed district manager of the San Joaquin Valley district of The National Supply Co. He succeeds Jean L. Philipp, who retired.

Davies started with the company in 1955. He has served as store manager at Mountain View and Avenal, Calif., and as a sales engineer in the Bakersfield area. He has served as assistant district manager of the San Joaquin Valley district since May 1956.

Corrosion Rectifying Co. Incorporates and Expands

Corrosion Rectifying Co. has incorporated and moved into a new office and warehouse location, it has been announced by Wayne A. Johnson, president of the Houston firm.

Johnson continues as president; J. H. Reynolds is vice president. Coreco's new office and warehouse centralizes

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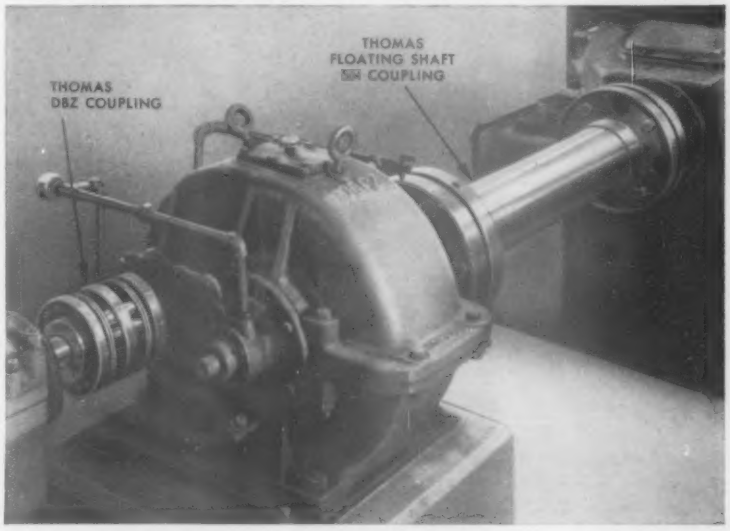
Give You Freedom From Coupling Maintenance



NO LUBRICATION NO MAINTENANCE NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.

They will protect your equipment and extend the life of your machines.

Properly installed and operated within rated conditions, Thomas Couplings should last a lifetime.

Under Load and Misalignment only Thomas Flexible Couplings offer all these advantages:

1 Freedom from Backlash Torsional Rigidity
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3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

engineering, service, and sales facilities. The new building will also house a new sister company. Electronics International, Inc., which will manufacture rectifiers for cathodic protection systems.

Payne Manufacturing Co. Announces Incorporation

V. H. Payne, owner of Payne Manufacturing Co., Houston, has announced the incorporation of the company under the firm name of Payne Manufacturing Co., Inc.

The company manufactures blowout preventer operating equipment, fluid accumulators, chemical, hydrostatic and tank battery pumps, and remote controls.

Payne, who formed the company in

V. H. PAYNE

W. E. WEBSTER

1946, will be president of the corporation; W. E. Webster, sales manager for 10 years, vice president; and R. A. Bridges, secretary-treasure.

The firm's main offices and plant are in Houston. Field sales and service offices are at Odessa, Tex.; Lafayette, La.; Corpus Christi, Tex.; Casper, Wyo.; Edmonton, Alta., Canada, and in Mexico and New York City for export.

Cameron Appoints Down-Under Representatives

The appointment of James Bayliss as sales and service representative for New Zealand, Australia, British and Dutch New Guinea, and the Philippine Islands has been announced by Cameron Iron Works, Inc., Houston.

Bayliss entered the petroleum industry in 1919 working first as a roustabout and then as a tool dresser and tool driller. He has served with the Anglo-Persian Co., British Burma Petroleum, Anglo-Iranian Oil Co., and Shell Oil Co.

Joining Tutt-Bryant, Representatives, in 1950, Bayliss represented National Supply Co., George E. Failing Supply Co., and Reed Roller Bit Co. in Australia. He started his own firm in 1953 with headquarters in Brisbane, Australia.

Coyle Joins Minerals & Chemicals' Mud-Sales Staff

A. I. COYLE

Arthur J. Coyle has joined the drilling-mud sales staff of Minerals & Chemicals Corp. of America, Menlo Park, N. J. C. Y. Haas, petroleum sales manager, made the announcement. Coyle will work on new products for both salt-water and fresh-water drilling muds.

Coyle has worked in the oil industry for 25 years. He advanced from roughneck to drilling contractor. He has had 8 years of chemical experience with American Cyanamid Co. and 2 years with Rumford Chemical Works. He comes to Minerals & Chemicals from the editorial staff of Offshore magazine.

Expansion for Beckman's Berkeley Division Planned

A $1,500,000 expansion program that will triple production capacity and increase plant personnel by nearly 1,000 has been announced by Berkeley division of Beckman Instruments, Inc. Groundbreaking for the first unit of the project is scheduled to begin soon on a six-acre site adjacent to Berkeley's present factory in Richmond, Calif.

Completion of the project, which will add 147,000 ft. of factory space, is expected late this year or early next year, according to Thomas Allinson, division manager.

The company makes analog computers, electronic counters and timers, frequency-measuring equipment, and nuclear instruments. Beckman Instruments bought Berkeley in 1952. The division moved to Richmond in 1946 and has expanded three times since that date.

Du Pont Petroleum Group Names District Manager

James G. McIlhiney has been made a district manager in the Du Pont Co.'s petroleum chemicals division. He will take over the newly created Denver district.

McIlhiney comes to his new post from Philadelphia where he was a salesman of petroleum additives. He joined Du Pont in 1947 and has been a sales representative to the refining industry on both the East and Gulf coasts.

McIlhiney's district consists of North Dakota, Montana, Wyoming, Colorado, New Mexico, the county of El Paso in Texas, and the western part of South Dakota and Nebraska.

Goodyear Industrial Group Makes Major Promotions

Four major promotions in Goodyear Tire & Rubber Co.'s industrial products division became effective Febru-

O. A. SCHILLING

H. R. COMSTOCK

ary 1, according to R. B. Warren, who became general manager of the division on that date.

Appointed to new posts were O. A. Schilling, sales manager; H. R. Comstock, assistant sales manager; R. E. Chapman, manager, Central region and R. E. Mercer, manager of hose sales.

Schilling joined Goodyear in 1939 and became district manager at Dallas

R. E. CHAPMAN

R. E. MERCER

for the industrial products division in 1941. Named eastern sales manager in 1947, he was appointed manager of industrial products departments in 1956.

Comstock joined Goodyear in 1929 as a tire salesman. He transferred to industrial rubber goods in 1935 and was promoted to manager of the division's district at Minneapolis in 1940. He was appointed Central sales manager in 1950.

Chapman has served as manager of the hose sales department since 1950. He served as an industrial products clerk and salesman at Chicago and Des Moines, Iowa, and as a field representative at Des Moines.

Mercer joined Goodyear in 1947 as a trainee. After 2 years of training in industrial products sales, he was assigned to Duluth, Minn., as a field representative. Transferred to Des Moines in the same capacity in 1951, he was appointed assistant manager of hose sales in 1953.

Lee Named Permian Basin Sales Engineer by Mission

H. A. LEE

Henry A. Lee has been appointed as centrifugal pump regional sales engineer for the Permian basin area by the industrial sales division of Mission Manufacturing Co. His headquarters will be in Midland. Lee, who has been with Mission 1½ years, will work with supply stores and industrial representatives that handle Mission products. He will devote considerable time to work in the secondary-recovery field. Lee has been an application engineer with Mission. Previously, he was with the Baroid sales division.

Jim Buxton has the same duties in the Kansas-Oklahoma district with headquarters in Tulsa.

Lubrikup's Frazier Promoted To New Managership

Marvin L. Frazier has been promoted to the newly created position as Mid-Continent sales manager for Lubrikup Co., Inc. He has represented the company as a sales engineer covering West and South Texas since 1938.

New Wire-Line Trucks Announced by BJ Service

BJ Service, Inc. has announced the completion of the first units of a fleet of new wire-line service trucks. Field-tested and now in actual use, the new BJ Service wire-line units, designated 300-H, are reported to exceed similar units in mobility, accuracy, operating ability, and safety. The first of these units has been assigned to the newly opened BJ Service station in Farmington, N. M.

A separate control compartment, fully insulated, with wide observation window, provides maximum visibility for the operator.

STREAMLINED WATERFLOODING...

with

Win Well 7-WAY MULTI-PORT ROTARY SELECTOR VALVE

7 WELLS (or less) CAN BE FLOODED FROM ONE CENTRAL SOURCE!

Low-cost water distribution to several wells at once . . . application of specific volumes and pressures to different wells . . . the ability to determine the productivity of any of the wells involved . . . these are the revolutionary advantages in applying the new Win-Well Multi-port Rotary Selector Valve to waterflooding systems. The simplicity of Win-Well's design, and the field-tested adaptability of the Win-Well Valve to other manifolding systems offers great advantages to multi-well operators. Detailed explanations of Win-Well's uses are yours upon request.

- Simplifies METERING TESTING SAMPLING GATHERING MANIFOLDING TANK-SWITCHING
- Cuts Costs on expensive Multi-well systems
- No Corrosion Worries
- Teflon Bushings
- Meehanite Castings

for MANUAL OPERATION or AUTOMATION

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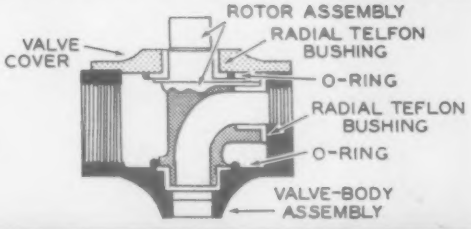

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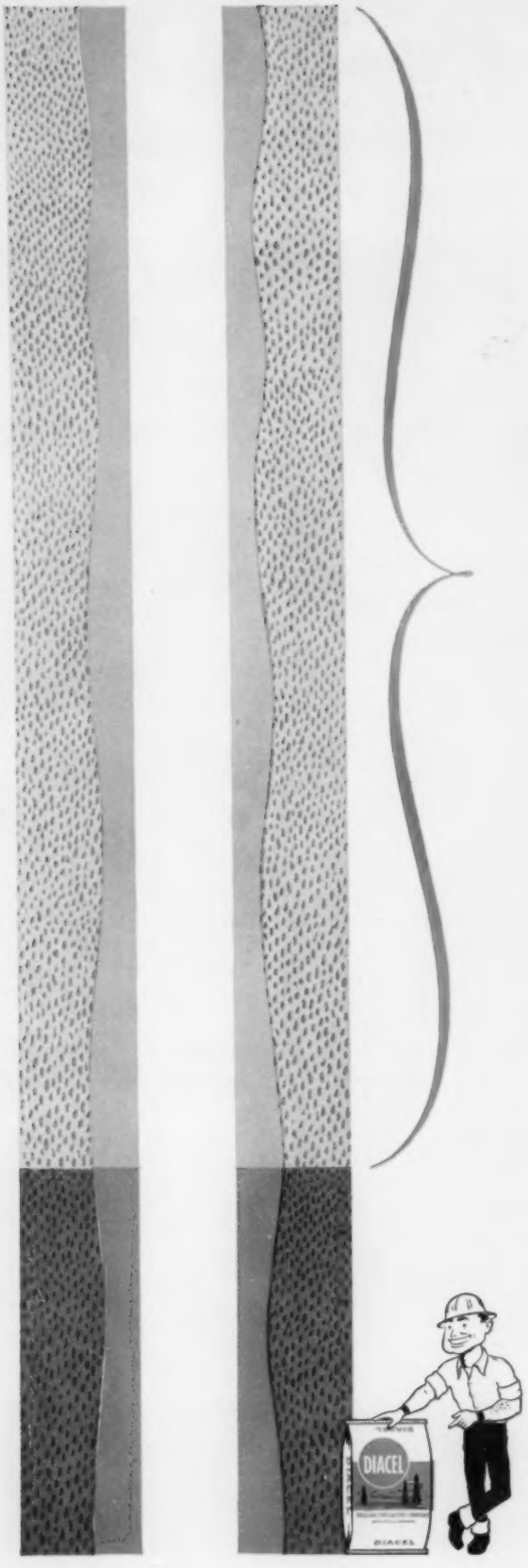

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DRILLING SPECIALTIES COMPANY
Bartlesville, Oklahoma

EXPLORATION

Rockies Dangle Rich Prospects Before Oil Finders

by Frank J. Gardner

AS you read this, 2,000 of the best oil-finding brains in the country are sending out thought rays to each other in Salt Lake City. The Rocky Mountain section of the American Association of Petroleum Geologists is holding its annual technical meeting; and this yearly session has come to be one of the most eagerly awaited and best attended in the nation. Why? Because no other oil province dangles so many prospects, so much virgin territory, or such a variety of challenges before the eager eye of the oil hunter.

A merry chase . . . It's been a merry chase in the Rockies for the past 10 years. The spheres of exploration interest have shifted rapidly from one basin to another, from one state to another, and from one formation to another. From Powder River to San Juan, to Williston, to Denver-Julesburg, to Uinta, to Nevada, to Paradox and back to Williston . . . that's been about the gist of it. It's an agile rockhound indeed who's been able to keep up with it all.

That's why these annual meetings are so vital to so many. Here's a chance to hear the other fellow's story, and perhaps to tell one's own. For 3 days, busy explorers can meet, relax, and exchange ideas. They won't tell **all** they know, but what they do tell will be weighed for wisdom and sifted for clues. No one mind can solve the myriad problems, but all the minds together can attack the major ones. New ideas and new concepts of old ideas will result, and the oil industry stands only to gain.

This year is Paradox year. Overshadowing every other Rocky Mountain area is the Paradox basin, scene of the most rewarding oil exploration since 1952. In less than a year, the wildcat drill has found half a billion barrels of new oil there. What it will find in the next 12 months can only be imagined, but an event of the past week underscores the potency of Paradox better than any forecast could possibly do. Just south of Aneth field in San Juan County, Utah, The Texas Co. finished its 6 Navajo-C (Section 25-40s-24e) as a dual producer, the first dual in the field. From Ismay pay at 5,602-20 ft., initial potential was 1,806 bbl. daily on 1-in. choke; the Aneth pay at 5,752-88 ft. flowed 1,656 bbl. on the same size choke. This 3,462-bbl. well is the best yet gaged in Paradox. Small wonder, then, that Rocky Mountain oil chasers are excited over this previously condemned basin.

OVERSHADOWING every other Rocky Mountain area today are the prolific flows of oil that are coming from the Paradox and Hermosa formations of southeastern Utah. This is a core from the Paradox, prime target of oil hunters in the Rockies today.

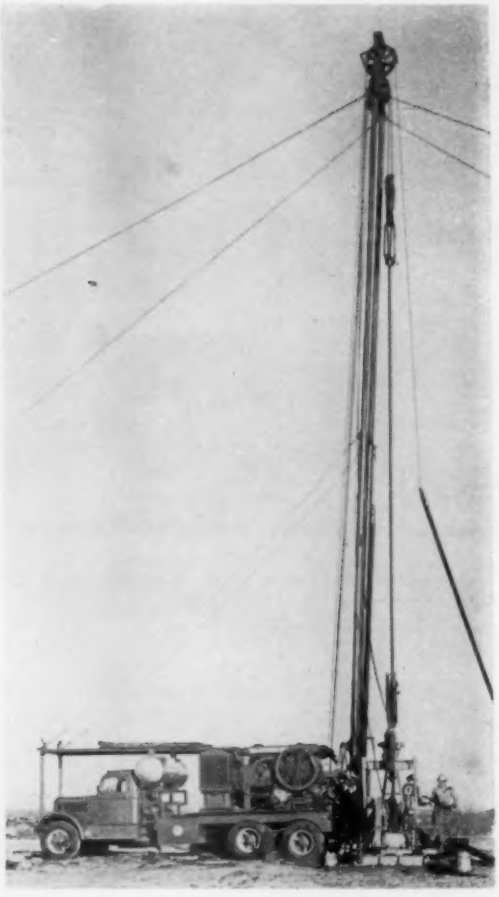
A large part of the success in this booming basin is attributed to the vast amount of stratigraphic study that has been applied to it. Surface and seismic work was helpful in the trap search, but pinning down the drillsite has been largely a matter of intimate acquaintance with facies changes within the basin proper. More and more, geologists are concentrating on finding big oil in big traps, and today, this means stratigraphic traps.

And a fight for attention . . . While Paradox holds center stage today in the Rockies, the Williston basin, an older but no less unpredictable prima donna, is taking bows upstage and trying mightily to steal the show. Successes at Outlook in northeastern Montana, and at Rocky Ridge in southwestern North Dakota, have keyed Williston to a new pitch of excitement. But it is no secret in exploration circles that here, too, the big oil must lie in stratigraphic traps, yet untouched.

The program at Salt Lake City reflects this thinking. Half of the technical sessions will be devoted exclusively to studies of the stratigraphic trap. The other half will cover "Modern Exploration Techniques," and it is significant that the majority of the papers in this half are concerned with stratigraphic and facies approaches.

Reflect a new awareness . . . The sessions at Salt Lake will serve notice to the industry that a new awareness is taking hold in the Rocky Mountains . . . an awareness that oil-finding success so far is only a glimmer of things to come in this vast region where vastness is an accepted synonym for greatness.

Here's What's Meant by a MODERN Well Servicing Unit



Pictured above is the C-25-A owned by Joe Youree Drilling Company, Electra, Texas. The C-25-A is one of nine models in the Walker-Neer "C" Series (two-drum and three-drum completion and workover spudders).

WALKER-NEER Model C-25-A
2-drum, all roller and ball bearing spudder for 4000′ to 6000′ workover and completion

Beam-type spudding action

On a large percentage of workover jobs there's drilling to be done, and in many cases you don't know it till you're in the hole. The Walker-Neer C-25-A provides: (1) top speed and power for every pulling operation, plus (2) a hard-hitting, beam-type spudding action that "really drills." With this double-duty rig, the rig-owner profits while saving the lease-owner a great deal of time and money!

Truck mount, legal width and weight

Oil companies are DEMANDING that moving costs in well servicing be reduced and this rig's the answer. Truck mounted—8 feet in overall width—legal weight—it moves as fast, easily, and economically as any two-drum pulling machine, yet has twice the versatility.

Air clutch performance

Both drums are full floating with the newest and most advanced air clutches mounted in the drum end. With effortless fingertip control you achieve the very ultimate in operating efficiency—positive grip, quick release, and instant response to every touch of the throttle, with an ability to "inch" the clutch or to throw it into full engagement, as required. Air spinning catheads are optional.

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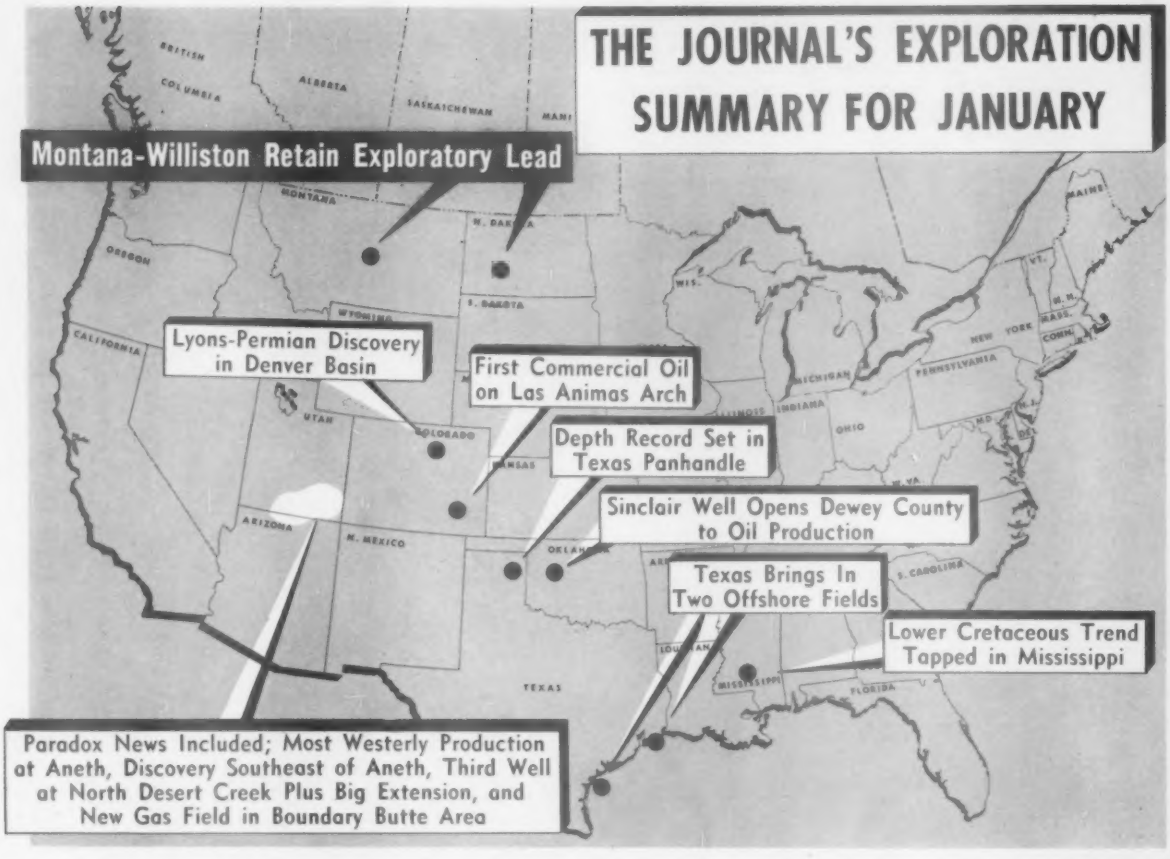


Aneth trend in the Paradox basin looks good, rank frontiers fall, but . . .

Williston Pushes to Front Center

by John C. McCaslin
District Editor

AMSDEN and Heath discoveries forced all other January wildcat news into the background as Montana-Williston kept its success lead for the second straight month. Big things were going on in this region at year-end, and now it appears we will see even more in 1957.

In Central Montana . . . The first real Amsden - Lower Pennsylvanian success since Wolf Springs hit the Montana Plains in January.

Texota Oil Co. is fulfilling a prophecy that Central Montana will be one of the nation's most active and interesting wildcatting areas in 1957. The 1 Goffena, a Musselshell County discovery, flowed 554 bbl. of oil per day on ¼-in. choke during production tests at 6,280-6,300 ft. The well is located 6 miles southeast of Gage Dome field in an area which had not been tested. Wolf Springs-Amsden field lies 25 miles southeast in Yellowstone County. Offset wells around Goffena will be watched closely in the next few months.

In Williston . . . The Williston basin ended 1956 with one of its best discoveries, Amerada Petroleum Corp. 1 Tange, in Sheridan County, Montana, and swept into 1957 with another one in North Dakota—Northern Pump Co. 1 Fritz in Billings County.

This important Heath-Upper Mississippian strike, 12½ miles south of Fryburg-Heath field production, flowed oil at the rate of 1,224 bbl. per day on 7-hour test at completion. Perforations in the Heath, a sparse producer in the Williston basin, were at 8,055-72 ft.

The well's flow makes it the most prolific Heath well in the basin, and one of the basin's best wells. Located in southwestern North Dakota, the Fritz success should set off a play throughout Slope, Stark, and Billings counties. It is the southernmost production in North Dakota. The only other Heath sand production in Williston is at Fryburg and Belfield in Billings and Stark counties.

The Regional Rundown

Although national wildcat interest was centered on Montana-Williston in January, there were important developments making the headlines in other provinces.

In Paradox . . . New discoveries and extensions in the Aneth trend of the Paradox basin gave strength to the belief that this newly emerged oil

Total January Completions, Exploration and Development

	Total completions							Total wildcat wells							Act.
	Total	Oil	Gas	Dry	Footage	Ser.	C.	Total	Oil	Gas	Dry	Footage	C.T.	D.D.	op.
Alabama	1	0	0	1	12,219	0	0	1	0	0	1	12,219	0	0	24
Arizona	3	0	1	2	14,061	0	0	3	0	1	2	14,061	0	0	0
Arkansas	122	92	0	30	349,049	0	0	16	3	0	13	66,132	3	0	79
California	158	104	2	52	775,574	1	1	47	4	1	42	271,809	0	2	204
Colorado	122	12	8	102	609,114	0	0	86	4	1	81	423,890	2	0	60
Florida	1	0	0	1	3,022	0	0	1	0	0	1	3,022	0	0	1
Illinois	249	105	0	144	576,750	0	0	65	2	0	63	138,939	90	2	461
Indiana	67	30	2	35	118,771	1	0	11	3	0	8	21,528	49	0	76
Kansas	399	165	31	203	1,425,461	7	1	84	10	2	72	328,785	92	1	384
Kentucky	163	63	18	82	273,408	0	0	39	7	1	31	58,527	150	0	170
West	145	62	1	82	210,614	0	0	39	7	1	31	58,527	132	0	143
East	18	1	17	0	62,794	0	0	0	0	0	0	0	18	0	27
Louisiana	363	218	27	118	2,647,976	0	10	62	14	9	39	670,335	0	0	447
North	161	109	13	39	565,739	0	0	15	1	1	13	99,209	0	0	126
South	152	74	12	66	1,594,760	0	8	41	9	8	24	496,482	0	0	221
Offshore	50	35	2	13	487,477	0	2	6	4	0	2	74,644	0	0	100
Michigan	31	9	2	20	98,681	0	0	15	1	0	14	43,874	28	0	57
Mississippi	30	14	0	16	211,598	0	1	13	2	0	11	101,405	0	0	35
Missouri	6	0	3	3	7,843	0	0	0	0	0	0	0	2	0	3
Montana	40	21	1	18	226,410	0	0	16	1	0	15	91,896	18	0	52
Nebraska, Western	74	21	0	53	437,479	0	0	47	4	0	43	280,046	0	0	37
New Mexico	232	121	65	46	991,392	0	1	35	8	3	24	194,060	7	4	192
Northwest	83	12	60	11	325,549	0	0	12	4	2	6	61,504	0	0	81
Southeast	149	109	5	35	665,843	0	1	23	4	1	18	132,556	7	4	111
New York	2	0	1	1	9,614	0	0	0	0	0	0	0	0	0	14
North Dakota	28	19	0	9	210,732	0	0	10	2	0	8	50,113	0	0	26
Ohio	99	57	16	26	253,416	6	0	2	0	0	2	5,993	98	2	132
Oklahoma	691	397	22	272	2,384,821	39	16	86	15	0	71	396,952	49	11	819
Pennsylvania	25	0	12	13	144,653	0	0	13	0	2	11	71,919	5	0	62
South Dakota	2	0	0	2	12,025	0	0	2	0	0	2	12,025	0	0	12
Texas	2,083	1,166	103	814	9,041,855	7	16	637	79	25	533	3,040,530	50	16	1,191
Dist. 1	104	44	5	55	336,484	0	0	48	0	3	45	203,412	2	0	41
Dist. 2	74	16	16	42	470,043	0	0	34	1	3	30	219,823	0	0	51
Dist. 3	182	83	21	78	1,346,503	0	5	58	7	8	43	498,611	0	0	160
Dist. 4	140	60	22	58	756,711	0	7	61	9	8	44	338,273	0	0	90
East	121	62	7	52	678,758	0	1	39	3	0	36	229,750	0	1	108
Dist. 7-B	294	158	3	133	950,957	0	0	115	11	2	102	393,142	15	5	138
West	546	406	5	135	2,634,482	0	0	108	15	1	98	565,895	13	5	415
Dist. 9	474	236	4	234	1,274,108	7	0	154	29	0	125	470,921	18	5	100
Dist. 10	148	101	20	27	593,809	0	3	20	4	0	16	120,703	2	0	88
Utah	15	7	1	7	88,195	0	0	9	3	0	6	47,568	1	0	43
West Virginia	62	3	42	17	178,073	0	0	5	0	5	0	20,086	61	0	187
Wyoming	90	43	4	43	390,992	0	0	31	6	0	25	161,825	11	0	132
Total Jan. 1957	5,158	2,667	361	2,130	21,493,184	61	46	1,336	*168	50	1,118	6,527,629	716	38	4,900
Western Canada	224	162	11	51	1,016,035	....	....	47	3	3	41	207,101	....	....	....
Alberta	116	81	8	27	600,275	....	....	25	0	2	23	127,055	....	....	....
Saskatchewan	76	63	0	13	331,885	....	....	15	3	0	12	55,143	....	....	....
Manitoba	28	18	0	10	61,153	....	....	5	0	0	5	13,028	....	....	....
British Columbia	4	0	3	1	22,722	....	....	2	0	1	1	11,875	....	....	....

*Incl. 12 dist. disc.: Calif. 1, S. La. 4, Okla. 2, Tex. Dist. (3) 1, Dist. (4) 2, Dist. (10) 2.
Note: Ser. (service wells); C. (cond. wells); C.T. (cable-tool compl.); D.D. (O.W.D.D.); Act. op. (active operations).

giant will be the nation's headliner in 1957.

Here is the Paradox score for January:

... North Desert Creek. Shell Oil Co. 22-12 North Desert Creek flowed 720 bbl. of oil per day on drill-stem tests of the upper Hermosa-Pennsylvanian at 5,275-5,340 ft., becoming the field's third producer.

Other production in the field is from the Paradox-Pennsylvanian. The 1 North Desert Creek discovery well flowed 1,440 bbl. of oil per day at 5,578-86 ft. on completion; Superior Oil Co. 1 Navajo-B made 1,402 bbl. per day at 5,607-36 ft. in the Paradox.

Southeast of this area Phillips Petroleum Co. and Aztec Oil & Gas Co. 1 Desert-A flowed 53.5 bbl. per hour from Paradox perforations. There is some upper zone Hermosa production at West Aneth, East Aneth, and Recapture Creek, but the Paradox member of the Hermosa remains the big producer in the Aneth region.

... Boundary Butte area. U. S. Smelting, Refining & Mining Co. 1 Ohio-Navajo is a new Hermosa gas producer for the Paradox basin. Flow was 9,500 M.c.f. of gas per day on tests. This success is 6½ miles west and north of North Boundary Butte field.

... Aneth area. Superior Oil Co. 1 Navajo-C, 3 miles southeast of production on Aneth's south side, was completed as a Paradox oil discovery in January.

Gulf Oil Corp. opened the westernmost production to date in the area at its 1 Desert Creek-Indian, 3½ miles southwest of Recapture Creek field. The well flowed 263 bbl. of oil per day from Paradox perforations.

In Denver basin . . . California Co. opened a new Permian oil field in Weld County, Colorado. The 1 Brunner pumped 79 bbl. of oil per day from Lyons sand. Location is 2 miles southwest of Loveland. The Lyons has been the object of sporadic exploration in this basin for the past few years. One field, Black Hollow, has proved to be rather successful.

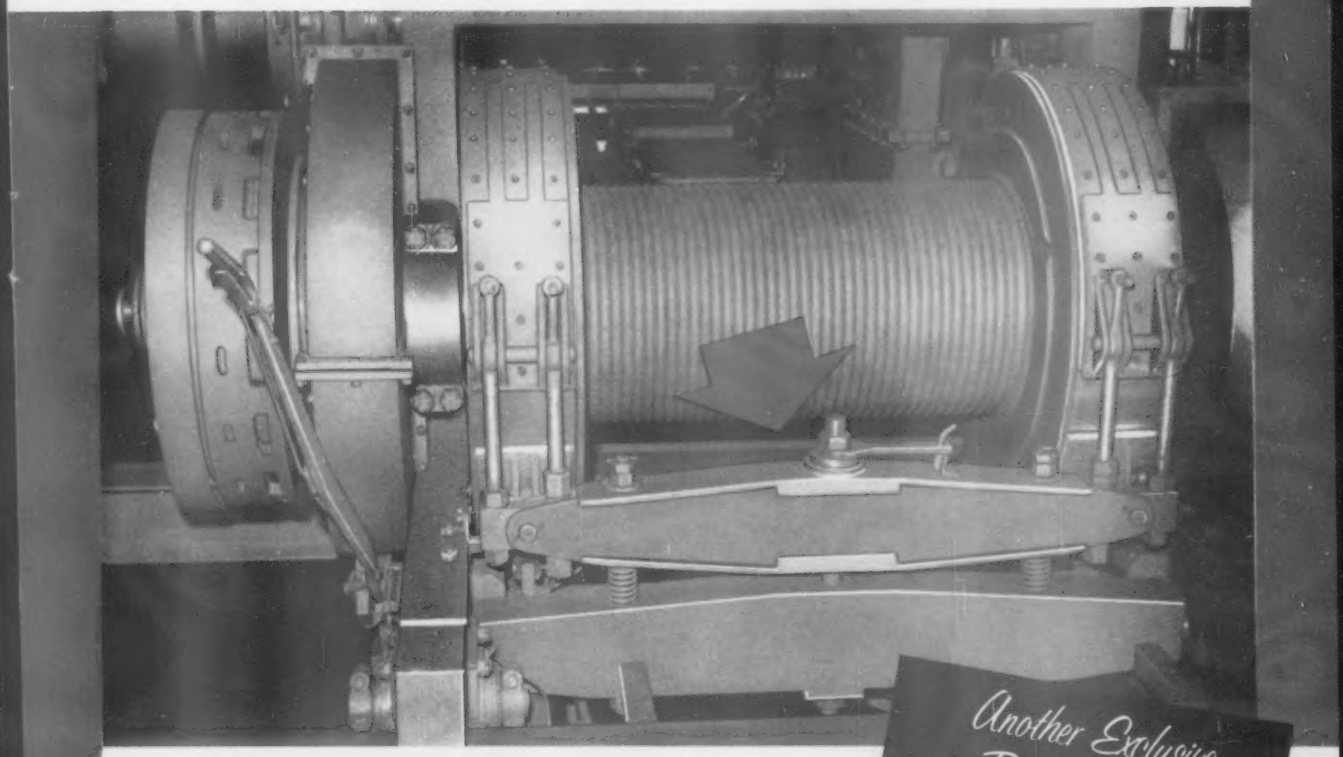
In Oklahoma . . . Another oil-barren county fell to the drill in this state.

Sinclair Oil & Gas Co. completed the 1 A. M. Kunc, rank discovery 8 miles southwest of Taloga, flowed 67 bbl. of oil in 8 hours from the Oswego-Pennsylvanian lime, giving Dewey County in the northwestern part of the state its first production. Just a few weeks ago,

(Text continued on page 206)
(Tables on pages 200 and 202)

Advanced...New...Sensational...

ONLY on WILSON SUPER RIGS!



NEW FRONT EQUALIZER BEAM TYPE BRAKE . . .

Absolutely no other line of rigs in the world have this feature. Wilson . . . always years ahead . . . with the most modern and sensational rigs in the world again sets the pace with the ALL NEW FRONT EQUALIZER BEAM TYPE BRAKE. Important . . . you bet! To the driller it means spectacularly SMOOTHER, more PIN-POINT PERFECT braking throughout drilling operations. So far ahead of all others, the *ENTIRELY* NEW Wilson Braking System has become one of the most appreciated features of Wilson SUPER Rigs because they are SAFE and *WILL NOT KICK.*

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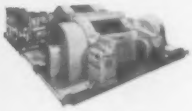
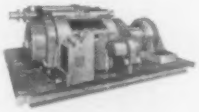
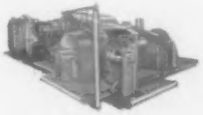


Super Titan "66"
22,000 Ft.—4½" Drill Pipe
25,000 Ft.—3½" Drill Pipe

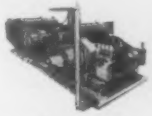


Super Titan "56"
15,000 Ft.—4½" Drill Pipe
19,000 Ft.—3½" Drill Pipe



Super Atlas
11,000 Ft.—4½" Drill Pipe
13,000 Ft.—3½" Drill Pipe

Super Giant
9,000 Ft.—4½" Drill Pipe
11,000 Ft.—3½" Drill Pipe



Super Mogul
7,500 Ft.—4½" Drill Pipe
8,500 Ft.—3½" Drill Pipe

A WHOLE NEW LINE OF RIGS

Breakdown of Field Wells Drilled in January 1957, by Depth

	0-1,250 (A)			1,250-2,500 (B)			2,500-3,750 (C)			3,750-5,000 (D)			5,000-7,500 (E)			7,500-10,000 (F)			10,000-12,500 (G)			12,500-15,000 (H)			15,000 and over (I)		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Alabama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arkansas	0	0	1	73	0	2	12	0	9	1	0	3	2	0	2	1	0	1	0	0	0	0	0	0	0	0	0
California	15	0	1	17	0	2	16	0	3	10	1	1	17	0	2	16	0	1	8	0	0	1	0	0	0	0	0
Colorado	0	0	1	1	0	0	1	1	0	4	1	4	2	4	16	0	1	0	0	0	0	0	0	0	0	0	0
Illinois	11	0	10	38	0	29	52	0	41	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indiana	9	2	8	17	0	14	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kansas	1	0	1	19	1	14	94	6	77	37	20	36	4	2	3	0	0	0	0	0	0	0	0	0	0	0	0
Kentucky	29	0	21	19	2	24	7	7	6	1	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West	29	0	21	19	0	24	7	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East	0	0	0	0	2	0	0	7	0	1	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Louisiana	3	0	4	70	3	3	30	1	13	3	2	2	15	3	9	43	3	22	29	2	10	11	2	12	0	2	4
North	3	0	2	69	3	3	26	1	12	3	2	0	2	3	4	5	3	3	0	0	1	0	0	1	0	0	0
South	0	0	2	1	0	0	4	0	1	0	0	2	10	0	5	18	0	12	21	0	7	11	2	10	0	2	3
Offshore	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	20	0	7	8	2	2	0	0	1	0	0	1
Michigan	0	0	0	2	0	1	4	1	2	1	1	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Mississippi	0	0	0	0	0	0	0	0	0	3	0	0	6	0	5	1	0	0	2	0	0	0	0	0	0	0	0
Missouri	0	3	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Montana	1	0	0	3	0	0	4	1	1	0	0	2	3	0	0	9	0	0	0	0	0	0	0	0	0	0	0
Nebraska	0	0	0	0	0	0	0	0	1	0	0	3	17	0	6	0	0	0	0	0	0	0	0	0	0	0	0
West	0	0	0	0	0	0	0	0	1	0	0	3	17	0	6	0	0	0	0	0	0	0	0	0	0	0	0
East	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Mexico	5	0	2	20	23	5	26	14	6	44	12	4	5	12	2	3	1	1	9	0	1	1	0	1	0	0	0
Northwest	0	0	0	1	23	2	1	13	1	2	10	0	4	12	2	0	0	0	0	0	0	0	0	0	0	0	0
Southeast	5	0	2	19	0	3	25	1	5	42	2	4	1	0	0	3	1	1	9	0	1	1	0	1	0	0	0
New York	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
North Dakota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	1	1	0	0	0	0	0	0	0	0
Ohio	15	3	6	3	1	3	39	7	14	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oklahoma	38	1	25	104	2	70	127	7	61	44	1	30	42	10	12	20	1	2	5	0	1	2	0	0	0	0	0
Pennsylvania	0	0	0	0	0	0	0	0	1	0	2	1	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Texas	75	2	30	241	8	87	263	14	46	201	7	40	196	21	47	78	21	23	25	4	5	8	1	3	0	0	0
Dist 1	12	2	0	10	0	7	12	0	1	7	0	1	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Dist. 2	0	0	0	0	0	0	1	1	1	3	3	4	6	4	5	5	5	1	0	0	1	0	0	0	0	0	0
Dist. 3	4	0	1	4	1	1	2	1	6	11	0	4	18	2	7	30	5	13	7	4	2	0	0	1	0	0	0
Dist. 4	3	0	0	7	0	5	2	4	1	7	1	1	26	4	4	6	5	2	0	0	1	0	0	0	0	0	0
East	0	0	1	9	0	1	3	0	1	9	0	3	35	4	9	2	3	0	0	0	1	1	0	0	0	0	0
Dist. 7-B	20	0	6	43	1	8	33	0	6	32	0	6	19	0	5	0	0	0	0	0	0	0	0	0	0	0	0
West	6	0	4	53	0	8	116	0	7	102	0	10	62	3	7	27	0	5	18	0	0	7	1	2	0	0	0
Dist. 9	30	0	18	109	1	55	14	0	19	30	0	11	21	3	5	3	0	1	0	0	0	0	0	0	0	0	0
Dist. 10	0	0	0	6	5	2	80	8	4	0	3	0	6	1	4	5	3	1	0	0	0	0	0	0	0	0	0
Utah	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0
West Virginia	0	1	2	3	14	5	0	15	5	0	7	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Wyoming	5	0	4	9	0	2	10	0	6	5	1	3	4	2	2	3	1	1	1	0	0	0	0	0	0	0	0
Total U. S.	207	12	116	639	54	263	686	74	298	356	68	139	318	63	108	190	28	51	80	7	17	23	3	16	0	2	4
Western Canada	0	0	0	23	1	6	9	2	1	82	2	1	36	2	0	9	1	2	0	0	0	0	0	0	0	0	0
Alberta	0	0	0	5	1	1	7	1	1	24	2	0	36	2	0	9	0	2	0	0	0	0	0	0	0	0	0
Saskatchewan	0	0	0	1	0	0	1	0	0	58	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manitoba	0	0	0	17	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
British Columbia	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

people

OF OKLAHOMA . . .

enjoy a rich and fruitful heritage. For this heritage, people of Oklahoma owe thanks, in part, to those Pioneer Women who made homes and raised their families in a new frontier.

For their courage, people of Oklahoma now fall heir to the rich rewards of the State's natural resources — foremost of which is OIL. On its 50th Anniversary of Statehood, Oklahoma finds iteslf a leader in the production of natural gas and gasoline, and is recognized as first in the nation in petroleum research.

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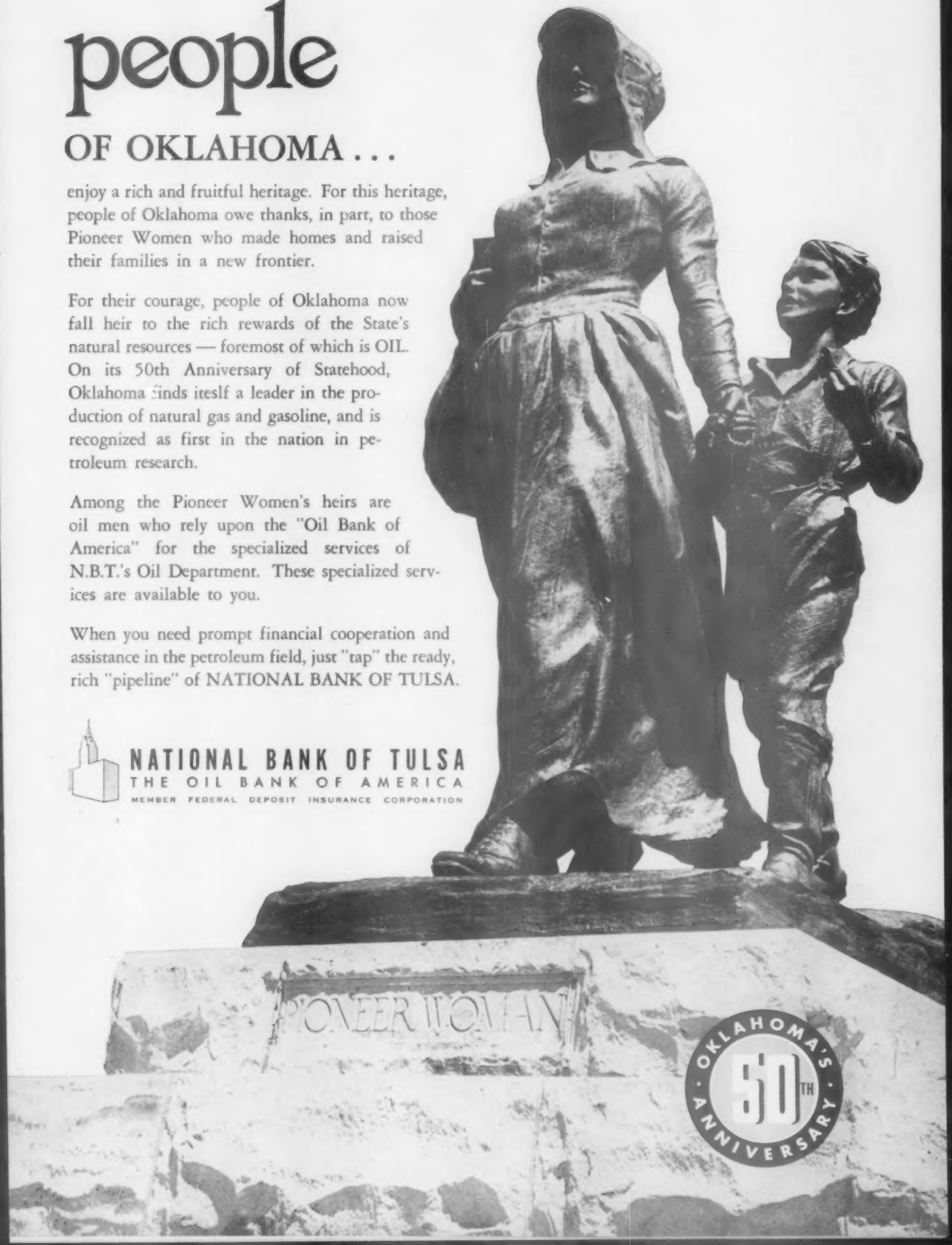
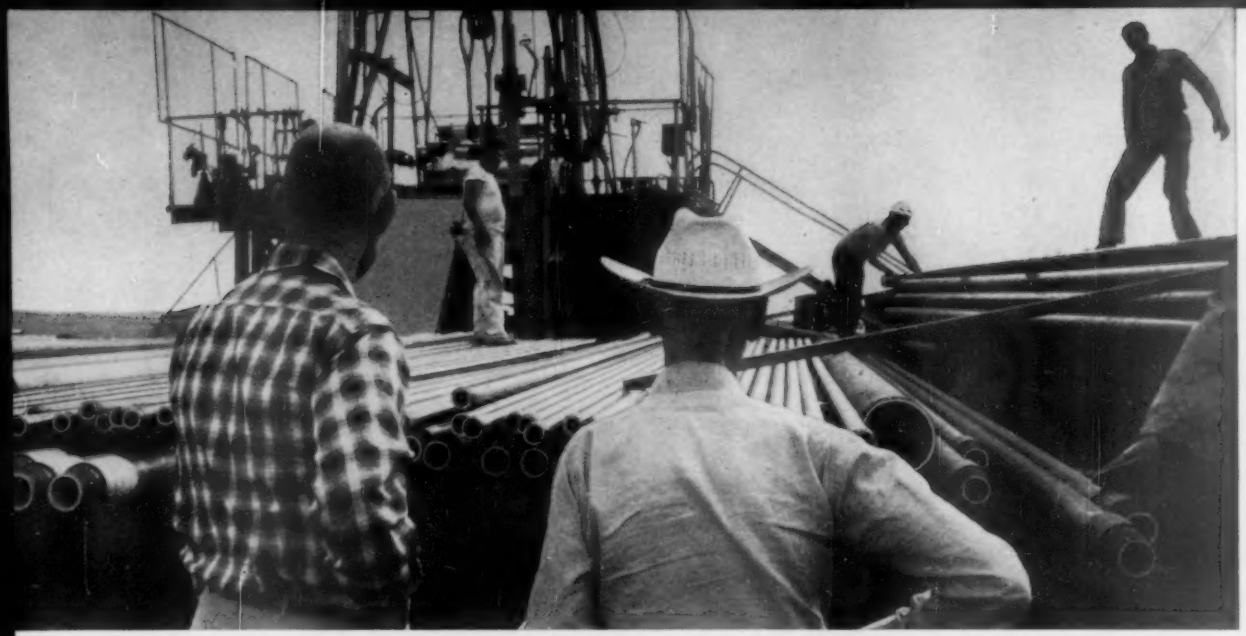


Breakdown of Wildcats Drilled in January 1957, by Depth

	0-1,250 A			1,250-2,500 B			2,500-3,750 C			3,750-5,000 D			5,000-7,500 E			7,500-10,000 F			10,000-12,500 G			12,500-15,000 H			15,000 and over I		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Alabama	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Arkansas	0	0	4	0	0	4	1	0	5	0	0	1	1	0	2	1	0	1	0	0	0	0	0	0	0	0	0
California	0	0	5	0	0	5	0	0	8	0	0	5	2	1	4	2	0	7	0	0	6	0	0	1	0	0	1
Colorado	0	0	3	0	0	3	0	0	15	3	0	20	0	1	39	1	0	2	0	0	0	0	0	0	0	0	0
Florida	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Illinois	0	0	8	0	0	27	2	0	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indiana	0	0	1	3	0	6	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kansas	0	0	1	0	0	6	3	0	23	5	1	32	2	1	10	0	0	0	0	0	0	0	0	0	0	0	0
Kentucky	3	0	20	1	0	6	3	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West	3	0	20	1	0	6	3	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Louisiana	0	0	0	0	0	0	0	0	1	1	0	0	0	0	11	1	2	6	3	3	13	4	1	6	5	3	2
North	0	0	0	0	0	0	0	0	1	1	0	0	0	0	9	0	1	2	0	0	1	0	0	0	0	0	0
South	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	4	2	3	11	3	1	5	4	3	2
Offshore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	1	1	0	0
Michigan	0	0	0	1	0	5	0	0	5	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mississippi	0	0	0	0	0	0	0	0	1	0	0	0	0	0	7	1	0	1	1	0	0	0	0	2	0	0	0
Missouri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Montana	0	0	1	0	0	1	0	0	2	0	0	2	0	0	5	1	0	4	0	0	0	0	0	0	0	0	0
Nebraska	0	0	0	0	0	0	0	0	1	0	0	5	4	0	37	0	0	0	0	0	0	0	0	0	0	0	0
West	0	0	0	0	0	0	0	0	1	0	0	5	4	0	37	0	0	0	0	0	0	0	0	0	0	0	0
East	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Mexico	0	0	1	1	0	3	0	0	6	1	0	6	4	2	5	0	1	0	2	0	0	0	0	3	0	0	0
Northwest	0	0	0	1	0	1	0	0	1	0	0	0	3	1	4	0	1	0	0	0	0	0	0	0	0	0	0
Southeast	0	0	1	0	0	2	0	0	5	1	0	6	1	1	1	0	0	0	2	0	0	0	0	3	0	0	0
New York	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Dakota	0	0	0	0	0	1	0	0	1	1	0	3	0	0	2	1	0	1	0	0	0	0	0	0	0	0	0
Ohio	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oklahoma	0	0	13	2	0	4	3	0	15	3	0	14	3	0	16	2	0	7	0	0	2	2	0	0	0	0	0
Pennsylvania	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	2	2	0	0	0	0	0	0	0	0	0
South Dakota	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Texas	3	1	23	15	0	129	11	1	87	15	4	78	22	6	129	9	8	60	3	5	22	1	0	3	0	0	2
Dist 1	0	0	2	0	0	12	0	0	13	0	0	6	0	1	9	0	0	1	0	2	1	0	0	0	0	0	1
Dist. 2	0	0	2	0	0	0	0	1	0	1	1	5	0	0	9	0	1	14	0	0	0	0	0	0	0	0	0
Dist. 3	0	0	0	0	0	2	0	0	0	0	0	0	4	2	6	2	4	21	1	2	12	0	0	2	0	0	0
Dist. 4	1	0	1	0	0	5	2	0	5	0	2	7	1	2	22	5	3	3	0	1	1	0	0	0	0	0	0
East	0	0	0	0	0	1	0	0	2	0	0	11	2	0	17	0	0	4	1	0	1	0	0	0	0	0	0
Dist. 7-B	0	0	8	1	0	28	3	0	36	5	1	10	2	1	20	0	0	0	0	0	0	0	0	0	0	0	0
West	0	1	4	4	0	9	2	0	12	3	0	21	5	0	30	0	0	8	0	0	6	1	0	1	0	0	1
Dist. 9	2	0	6	10	0	72	3	0	18	6	0	15	8	0	13	0	0	1	0	0	0	0	0	0	0	0	0
Dist. 10	0	0	0	0	0	0	1	0	1	0	0	3	0	0	3	2	0	8	1	0	1	0	0	0	0	0	0
Utah	0	0	1	0	0	0	1	0	1	0	0	1	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0
West Virginia	0	0	0	0	2	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Wyoming	1	0	0	0	0	4	1	0	2	2	0	7	1	0	8	1	0	3	0	0	1	0	0	0	0	0	0
Arizona	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Total U. S.	7	1	76	23	2	205	25	2	211	31	6	186	41	14	277	20	13	98	9	8	45	7	1	15	5	3	5
Western Canada	0	0	4	0	0	5	0	0	11	3	1	8	0	1	9	0	1	3	0	0	1	0	0	0	0	0	0
Alberta	0	0	3	0	0	2	0	0	3	0	1	4	0	0	7	0	1	3	0	0	1	0	0	0	0	0	0
Saskatchewan	0	0	1	0	0	1	0	0	5	3	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Manitoba	0	0	0	0	0	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
British Columbia	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

HERE'S WHAT IT'S CALLED
HERE'S WHO MAKES IT
JELFLAKE
REG. U. S. PAT OFF.
DOWELL
STOPS LOST CIRCULATION BETTER THAN ANYTHING ELSE
FRAGMENTED PLASTIC FOIL USED IN DRILLING MUD AND CEMENT TO PREVENT FLUID LOSS INTO FORMATION
A
THIS MUCH GOES A LONG WAY
THE PURCHASER IS HEREBY LICENSED TO USE THE MATERIAL HEREIN FOR PRACTICING THE INVENTION OF THE UNITED STATES METHOD AND FLUID PATENT NO. 2,353,372.
NET WEIGHT 25 LBS.
DOWELL INCORPORATED
TULSA, OKLAHOMA



Frank Watts, left, veteran store manager for an independent distributor, having a branch at Bay City, Tex., and H. P. (Pat) McGuirt, tool pusher for Otis Russell Drilling Co., watch Pittsburgh Seamless casing being unloaded at a rig near Damon, Tex.

Oil Field Emergencies Demand Quick Action

It's shortly after midnight as Frank loads a swedge from his store for delivery to the Damon well.

Once he's at the well, Frank sits down in the bunk house with Mr. McGuirt to go over an order for delivery the next day.

Here's Why You Can Rely On Pittsburgh Steel's Independent Distributors

The telephone shrilled at 4 a.m. in the Bay City, Texas home of Frank Watts.

An oil driller in distress was phoning his independent distributor on Christmas Day.

The oil man told Frank he needed a small valve immediately to keep his rig in operation, Christmas or no Christmas.

Frank, a veteran supply man and manager of an independent supply company store, was on his way quickly. He opened his store, got the valve, delivered the item to the worried driller and made it back home in time to watch the kids open their gifts at 8 a.m.

As one of the independent distributors representing Pittsburgh Steel Company, Frank knew the importance of the driller's call. Answering oil field SOS's is an old story to the Watts family.

Not every holiday is disrupted but these SOS's are frequent enough that his wife recalls any number of times when Frank has shown up at dawn due to similar emergencies. For example, there was the night when he made a round trip to Houston (180 miles) for $12.00 worth of parts he was temporarily out of and which were badly needed on a rig.

At 36, Frank Watts is a tall, raw-boned, friendly man the movies would cast as a typical Texan. But more important, he's an oil field business man, a representative of one of the 18 independent distributors (listed at **right**) **handling Pittsburgh Seamless. And he has nearly 15 years of experience under his belt.**

He is accustomed to working 65 hours a week and it doesn't bother him to get frequent night calls, half of them to open his store so a driller can get an item he needs, the other times an SOS for delivery of supplies to keep a drilling operation going.

Frank Watts has "service" as his first and strongest business byword. Quality of the products he handles is a close second. As he puts it:

"I learned a long time ago that service and the best products available are the keys to profit and success in this supply business.

"If we handle only good quality stuff, proven material the men at

An oilman's assurance of quality—Pittsburgh Seamless—is the topic of this conversation Frank is holding at the well-site.

Frank watches cat-heading of Pittsburgh casing as it is run into hole. Frank's company handles a full range of Pittsburgh Drill Pipe, casing and tubing.

the rigs can rely on, and give them all the service they need, we'll get their business and we'll keep it."

Those words stand as testimony to the quality of Pittsburgh Steel Company's drill pipe, casing and tubing. The company Frank works for handles only Pittsburgh drill pipe, although it offers several manufacturers' casing and tubing.

They prove, too, why the independent supply house has become such a vital force in the oil and gas fields.

Independent distributors are ready for action around the clock. Frank's store stocks nearly 3,000 different items ready for delay-free normal operation or for emergencies.

An independent distributor's service is flexible. The independents are personal friends to the oil men they serve. Through their long experience, they know the problems oil men face and can meet their requirements without red tape and extra paper work. They are free from remote control and can make big decisions without wasting time. The independent store is usually the first in an oil field and the last to leave, if it ever does. Its personnel live in the area their stores serve. Their own personal futures are tied to the success they generate for themselves.

Independent distributors help keep costs low. Though they specialize in service, their prices are competitive. Their livelihood depends on meeting competition. Almost with no exception, the independent's representative will stay in the area of his store, not move on every couple of years. The money the independent makes stays where he makes it.

The independent offers only the best in equipment because he buys only what he wants to buy. He is free to select from the best equipment made. Pittsburgh Steel and all the other reputable manufacturers back up the independent distributor.

Independents are the most accessible suppliers in the oil fields. For example, Pittsburgh Steel's distributors have a total of 140 stores in all parts of the oil and gas fields.

Next time you buy drill pipe, casing or tubing use the team that can't be beat: Pittsburgh Seamless and your independent distributor.

Distributor Home Offices

Bradford Supply Company
130 Main Street
Bradford, Pennsylvania

Buckeye Supply Company
18 Harrison Street
Zanesville, Ohio

C. W. Cotton Supply Company
Utica National Bank Building
Tulsa 5, Oklahoma

Franklin Supply Company
624 South Michigan Avenue
Chicago 5, Illinois

Houston Oil Field Material Co.
1524 Maury Street
Houston, Texas

Industrial Supply Company
500 Eighth Street
Wichita Falls, Texas

Iverson Supply Company
400 West Fifth Street
Tulsa, Oklahoma

Lucey Export Corporation
233 Broadway
New York 7, New York

Lucey Products Corporation
624 South Cheyenne
Tulsa 19, Oklahoma

McJunkin Corporation
P. O. Box 513
Charleston 22, West Virginia

Midland Supply Company
Box 3105
Washington St. Station
Wichita 7, Kansas

Mountain Iron & Supply Co.
100 Rule Building
Wichita 2, Kansas

Murray Brooks, Incorporated
P. O. Box 855
Lake Charles, Louisiana

Producers Supply & Tool Co.
706 Commercial Standard Bldg.
Fort Worth 2, Texas

Rodman Supply Company
P. O. Box 2752
Odessa, Texas

Southwest Supply Company
1720 Oliver Building
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
P. O. Box 1800
Shreveport, Louisiana

Western Supply Company
424 North Boulder Avenue
Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta	Columbus	Detroit	New York	Tulsa
Chicago	Dallas	Houston	Philadelphia	Warren, Ohio
Cleveland	Dayton	Los Angeles	Pittsburgh	

Breakdown of Footage for January 1957

	Field footage			Wildcat footage		
	Oil	Gas	Dry	Oil	Gas	Dry
Alabama	0	0	0	0	0	2,219
Arizona	0	0	0	0	5,648	8,413
Arkansas	223,606	0	59,311	17,931	0	48,201
California	461,498	3,754	38,513	30,748	6,510	234,551
Colorado	35,431	38,162	111,631	14,385	6,017	403,488
Florida	0	0	0	0	0	3,022
Illinois	243,294	0	194,517	5,885	0	133,054
Indiana	43,457	2,158	51,628	6,685	0	14,843
Kansas	522,685	119,536	454,455	41,837	10,156	276,792
Kentucky	80,682	58,794	75,405	13,058	3,532	41,937
West	76,682	0	75,405	13,058	3,532	41,937
East	4,000	58,794	0	0	0	0
Louisiana	1,191,520	140,096	646,025	179,332	114,017	376,986
North	282,636	61,695	122,199	4,616	8,424	86,169
South	626,979	56,260	415,039	123,915	105,593	266,974
Offshore	281,905	22,141	108,787	50,801	0	23,843
Michigan	26,295	7,122	21,390	2,040	0	41,834
Mississippi	76,840	0	33,353	19,579	0	81,826
Missouri	0	1,152	6,691	0	0	0
Montana	119,716	3,050	11,748	9,950	0	81,946
Nebraska	106,413	0	51,020	23,561	0	256,485
West	106,413	0	51,020	23,561	0	256,485
East	0	0	0	0	0	0
New Mexico	476,522	226,923	93,887	52,538	21,209	120,313
Northwest	37,566	207,272	19,207	18,340	14,423	28,741
Southeast	438,956	19,651	74,680	34,198	6,786	91,572
New York	0	5,114	4,500	0	0	0
North Dakota	152,078	0	8,541	12,169	0	37,944
Ohio	142,843	47,434	57,146	0	0	5,993
Oklahoma	1,317,109	102,857	567,903	91,105	0	305,847
Pennsylvania	0	69,941	2,793	0	15,276	56,643
South Dakota	0	0	0	0	0	12,025
Texas	4,457,573	459,821	1,083,931	388,996	185,258	2,466,276
Dist. 1	106,088	2,276	24,708	0	28,505	174,907
Dist. 2	96,449	83,199	70,572	4,970	15,051	199,802
Dist. 3	509,275	105,163	233,454	54,995	71,594	372,022
Dist. 4	268,705	82,964	66,769	56,330	60,115	221,828
East	313,125	50,778	85,105	23,515	0	206,235
Dist. 7-B	456,610	2,325	98,880	47,275	9,578	336,289
West	1,838,729	31,495	198,363	66,826	415	498,654
Dist. 9	529,179	20,271	253,737	105,158	0	365,763
Dist. 10	339,413	81,350	52,343	29,927	0	90,776
Utah	23,274	12,293	4,970	15,168	0	32,490
West Virginia	5,561	106,517	45,909	0	20,086	0
Wyoming	136,129	25,398	67,640	26,371	0	135,454
Total United States	9,842,526	1,430,122	3,692,907	951,338	387,709	5,188,582
Western Canada	734,092	36,242	38,600	13,369	18,825	174,907
Alberta	424,381	25,395	23,444	0	11,781	115,274
Saskatchewan	271,964	0	4,778	13,369	0	41,774
Manitoba	37,747	0	10,378	0	0	13,028
British Columbia	0	10,847	0	0	7,044	4,831

first production was opened in Woodward County, another northwestern county.

In the Panhandle . . . A deep 16,000-ft. wildcat in Hemphill County, Texas, established a drilling-depth record for the Panhandle. Magnolia Petroleum Co. went to 15,997 ft. at its 1 Feldman, 10 miles northeast of Glazier. Bottom of the hole is in the Ellenburger. At month's end, testing was under way in deep Pennsylvanian sands at the well. Success at the 11,500-ft. mark in the Morrow-Pennsylvanian could also establish a producing-depth record for the Panhandle. Location is 4½ miles west of the Oklahoma line.

In Colorado . . . First big commercial-oil production was opened on southeastern Colorado's elusive Las Animas arch. Continental Oil Co. 1 Lynn, Kiowa County wildcat, was completed pumping 240 bbl. of oil per day from the Marmaton - Pennsylvanian. The Lynn oil discovery is the first big development on this long arch since Bents Fort field was opened in 1956. The arch separates the Denver and Anadarko basins. Continental's search should set off a new flurry of drilling on its east side, where probable hidden strat traps await the drill.

In Mississippi . . . California Co. opened what appears to be another major field in the deep Lower Cretaceous trend that is shaping up across southern Mississippi and southwestern Alabama.

The 1-5 Central flowed at the rate of 314 bbl. of clean oil per day on its first 12-hour gage from perforations in the Sligo-Bailey zone at 11,693-11,702 and 11,758-64 ft. Location is 50 miles southeast of Bolton field, the nearest Lower Cretaceous production on the trend. At the southeast extremity of the trend lies prolific Citronelle field in Alabama.

In Gulf waters . . . Texas' seventh and eighth offshore producing areas were opened. Arkansas Fuel Oil Corp. 1 State Tract 950-S, 8 miles southeast of Flour Bluff off Nueces County, flowed 6,000 M.c.f. of gas per day on first tests.

The old McFaddin Beach prospect in Jefferson County got its first commercial production, giving Texas its eighth field with production in the Gulf of Mexico. The well made 267 bbl. of oil per day. Location of the McFaddin Beach success is 7½ miles east of High Island, and about 20 miles west of Sabine Pass.

Editor's Note . . . Starting with the January monthly report, more detail information is given on well completions.

Note on the regular completion report that columns have been added showing service wells and condensate wells. Condensate wells are included in oil-well completions, and service wells are a part of dry-hole totals. Another column near the right side of the table shows wells drilled deeper during the month. These wells are not included in completion totals.

Another table shows a breakdown of both wildcat and development footage by oil, gas, and dry holes.

To add further information on wells completed during the month, depth classifications have been separated to show wildcat and development drilling. Further, each depth classification is broken down to show oil, gas, and dry.

Your comments on these changes will be appreciated.

EXPLORATION HIGHLIGHTS

APPALACHIAN

WEST VIRGINIA

In Licking district, Tucker County, West Virginia, Hope Natural Gas Co. 10009 Thaddeus Pritt wildcat, elevation 3,385 ft., had a final gage of 6,472,000 cu. ft. gas after fracture. Chert 4,232 ft., Oriskany sand 4,420-4,523 ft., gas 4,464-69 ft., Helderberg 4,523 ft., gas 4,553 ft., total depth 4,626 ft. This company has made location for its No. 10017 on other Pritt lands, elevation 2,256 ft., Belington Quadrangle 0.30 mile south of latitude 39 degrees 15 minutes and 0.15 mile west of longitude 79 degrees 45 minutes.

Exploration This Week

Appalachian	206
Cambrian discovery	209
California	210
Oklahoma	210
East Texas	210
Hugoton Embayment	211
Rocky Mountain	214
Texas	215
Kansas	216
Deep Edwards Test	217
Canada	217
Michigan	222
North Dakota	222

PENNSYLVANIA

In Armstrong Township, Indiana County, Southwest Pennsylvania, Peoples Natural Gas Co. 4108 Harry L. George, wildcat, elevation 1,306 ft., gaged 4,800,000 cu. ft. gas after fracture. Chert 7,443 ft., Oriskany sand 7,578 ft., gas 7,579-87 ft., total depth 7,607 ft.

● James I. Shearer et al started drilling again with a rotary outfit in 1 L. Thompson and is now at 5,400 ft.

OHIO

An extension and a ½-mile step-out to Gratiot pool in Hopewell Township, Muskingum County, were completed during the week. Mutual Oil & Gas Co. 1 Edward Warner, Lot 34, logged the Clinton at 3,269-95 ft. and gaged 250,000 cu. ft. gas and 400 bbl. in a 6½-hour test after fracture. Oil Development Co. 1 Geo. L. Porter, Section 4, made 90 bbl. and 500,000 cu. ft. gas in 24 hours after fracturing Clinton at 3,250-3,301 ft.

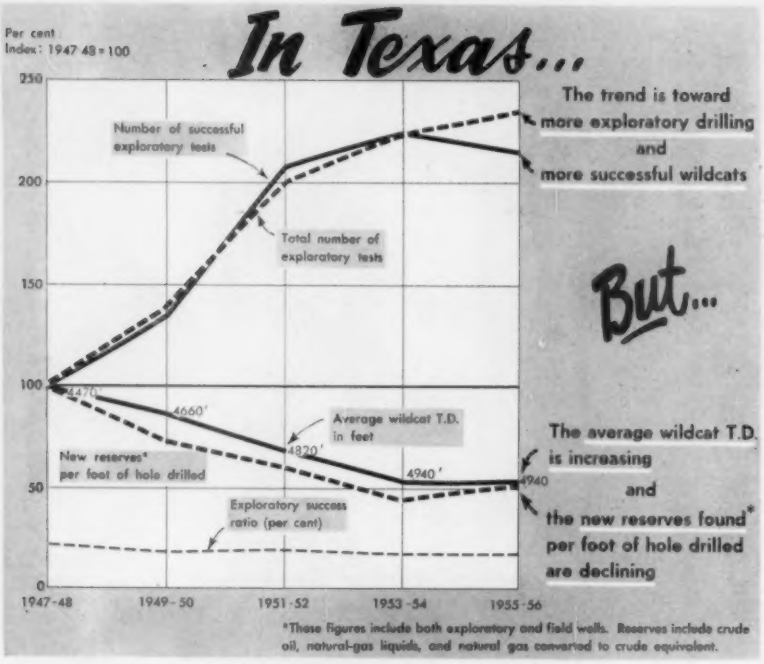
● Two extensions to Chippewa gas field gaged large volumes after fracture. East Ohio Co., 1 Grabor Community, Section 36, Chippewa Township, Wayne County, made 6,375,000 cu. ft. from Clinton at 3,842-72 ft. and Roy Stewart 1 Radebaugh and Davis, Section 1, Baughman Township, made 7,000,000 cu. ft. from Clinton at 3,836-45 ft.

● Oil Well Drilling Co. 1 E. C. Shrimplin, Section 10, Killbuck Township, Holmes County, a semiwildcat, found the Clinton at 3,225-50 ft. and gaged 850,000 cu. ft. and 25 bbl. oil after fracture.

EASTERN KENTUCKY

On Prater Creek in the Floyd County sector of Big Sandy gas field, Kentucky West Virginia Gas Co. have completed 6364 Jasper Johnson as a Devonian black shale gas producer. An initial open flow of 327,000 cu. ft. of gas daily was recorded after shooting the shale section from 2,449 to 3,005 ft. Top of shale was logged at 2,428 ft. and bottomed at 3,005 ft. total depth.

Otis Does Tubing Work, Too.



Success ratio is constant but . . .

Fracturing Retards Deep-Hole Drilling Trend in Texas

This article is the second in a series on exploration drilling results over the nation.

by Norman S. Morrisey
Drilling-Development Editor

HYDRAULIC fracturing has temporarily retarded the trend toward deeper exploratory drilling in the State of Texas. During 1947-1954, the average wildcat total depth increased at a fairly constant annual rate from 4,470 to 4,940 ft. However, during the past 3 to 4 years the average wildcat total depth has been fairly constant at 4,940 ft. This is undoubtedly temporary, and within the next few years the trend toward deeper exploratory drilling will again be established.

The return on drilling in Texas continues to decline. During 1947-48, each foot of new hole added 56.2 bbl. of new reserves. These figures include all wells, both exploratory and field; reserves include all new reserves, crude oil, natural-gas liquids, and natural gas converted to crude equivalent. However, in the 1955-56 period, new reserves were added at a much lower rate, only 29.4 bbl. per foot of hole.

Surprisingly enough, this is an increase over the 1953-54 low of 25 bbl. of new reserves per foot of hole. Most of this increase in the last 2 years, however, is due to an increase in gas reserves added rather than new crude reserves. As a matter of fact, new crude added during 1955-56 was slightly less than during 1953-54.

Surprisingly enough, the wildcat-success ratio in Texas has been fairly constant over the last 10 years, hovering at the 20 per cent mark. These figures, of course, include all exploratory tests, and are slightly better than the national average of 17 per cent.

Top areas . . . West Central and North Texas dominate the exploratory scene in Texas. Here the shallow and intermediate depths lure the independents. And nearly 40 per cent of all wildcats in Texas are drilled in these two areas. However, there is little doubt that West Texas is and will remain a prime exploration region for many years to come.

But even West Texas is stepping aside to make room for a real prima donna—the Panhandle. During 1956, exploratory drilling in the Panhandle scored an impressive success ratio of 41.5 per cent—29 oil wells and 23 gas wells out of 125 attempts.

The outlook for Texas exploration is bright. There are several relatively unexplored basins that have the necessary requisites for oil provinces. The Delaware and Val Verde basins in West Texas and the Palo Duro in the Panhandle are in the running for top exploration honors. One or two successful discoveries in any of these basins could convert an unwanted stepchild into an exploration Cinderella.

New reserves . . . New crude reserves added during the 10-year period has varied from a low of 611,000,000 bbl. in 1952 to a peak of 2,725,235,000 the previous year, 1951. These figures include both exploratory and development wells.

On the average during the past 10 years, new reserves have been added at the rate of about 1 billion barrels per year. However, the yearly production during the past 5 years has been at the rate of 1 billion barrels per year.

Thus, Texas has not added appreciably to its total reserves for the past several years.

During 1952-54, gas reserves were added at the rate of 4.4 trillion cubic feet per year. In the preceding 7 years, the normal rate for adding new reserves was about 7 trillion cubic feet. However, during the past 2 years the gas reserve picture has improved, probably due in part to new pipeline outlets and more gas wells completed, especially during 1956.

Reserves are constant . . . Total reserves added during the past 10 years have been fairly constant. If natural gas reserves are converted to crude equivalent, new reserves have been added at the rate of 2.6 billion barrels per year.

Since the number of wells is steadily increasing each year and the total reserves added remains constant, this can only mean that each new well finds less reserves as the years pass.

Texas oil finders are concentrating on deeper drilling and finding stratigraphic traps like East Texas. The problem is to find more like it. **End.**

D.S.T. Shows New Cambrian Prospect

by Carl Hoot
District Editor

The possibility of another Cambrian strike in Stonewall County was top news last week in West Central Texas.

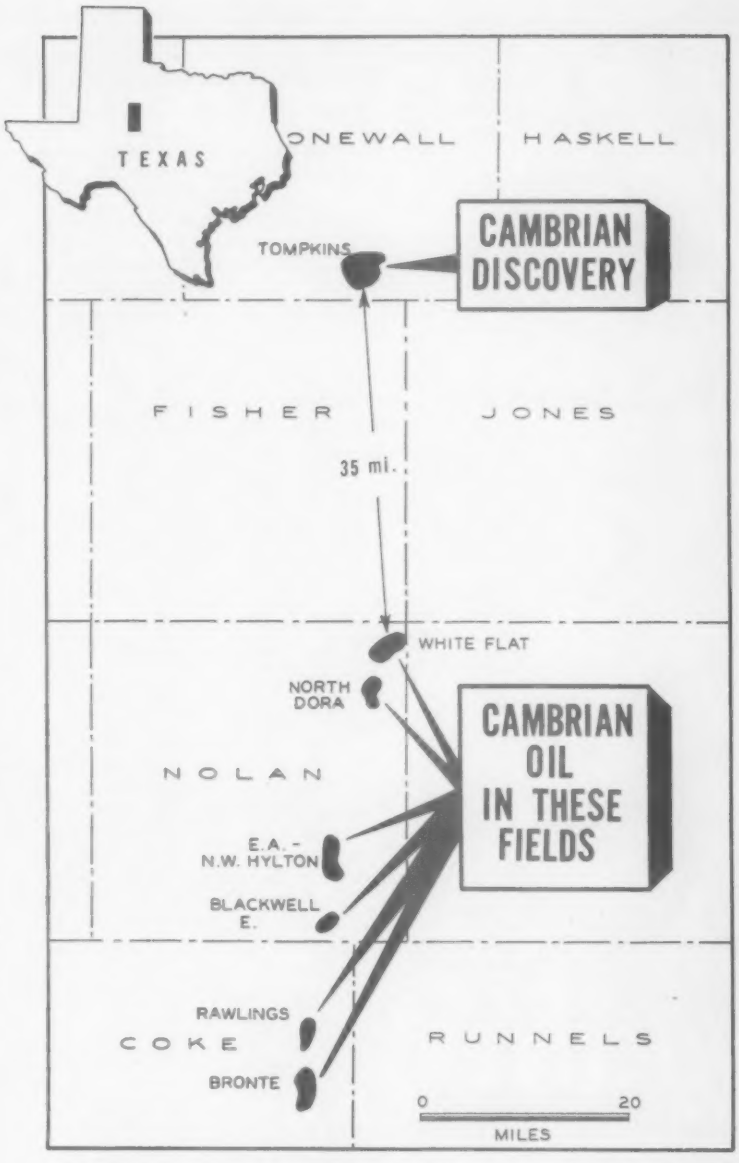
The prospect is J. R. McLean, Dallas, and J. D. Tompkins, Abilene, 1-A Trammell, located in Section 135, Block 1, H&TC Survey. It is 9½ miles south of Aspermont and on the northeast side of Tompkins field.

At this writing, drill-stem tests in the Cambrian sand were the only basis for the new-pay prospect. An 80-minute test ran from 5,896-5,916 ft. had gas at the surface in 6 minutes and oil in 70 minutes. It was not allowed to flow and no estimate was made on the flow rate. Oil unloaded when drill pipe was pulled. Flowing pressure ranged from 325-1,200 psi., and 45-minute shut-in pressure reached 2,525 psi.

Dual completion . . . Operators were expected to make a dual completion of the discovery. Top of the Ellenburger was placed at 5,665 ft. Drill-stem tests in that formation recovered 600 ft. of oil at 5,690-5,770 ft., and 180 ft. of oil and gas-cut mud at 5,770-5,820 ft.

Multipay field . . . Tompkins field currently produces from five pay zones. These are Canyon sand at 4,900 ft., Strawn sand at 5,400 ft., a chert at 6,000 ft., and the Ellenburger. No. 1-A Trammell is ½ mile southeast of Sun Oil Co. 2-A Martin which opened Ellenburger production in the field earlier this year. Sun's well flowed 138 bbl. of oil in 9 hours through 21/64-in. choke from perforations at 5,895-5,925 ft.

Previous Cambrian oil . . . At this time the nearest Cambrian oil is 35 miles south in White Flat in Nolan County. Stonewall County's first Cambrian discovery, and the northernmost well in what has been termed the Cambrian trend, running north from Bronte field, Coke County, was northwest of Aspermont in Schick field. This well was American Liberty Oil Co. 2 Shadle et al, completed in November 1955. It has since been depleted in the Cambrian formation and recompleted as a Strawn sand discovery.



MAP SHOWS LOCATION of Tompkins field in relation to other fields in the "trend" which have Cambrian production. The Tompkins well flowed oil from the Cambrian but had not been completed at this writing.

Start of the trend . . . Cambrian oil was first discovered, east of Central basin platform, at White Flat field in June 1953. The following year a good Cambrian producer was added to Bronte field. Good porosity in most areas, and thick pay sections, fanned the Cambrian development in all the fields from Bronte to White Flat.

Discovery of oil in the Cambrian sand, and in some areas, the Wilberns dolomite (immediately below the sand) has given operators additional zones to shoot for, with little expense for additional drilling. A number of Cambrian producers are dual producers, the Pennsylvanian being the second zone. The Ellenburger is sometimes missing completely, or found to be eroded to a thin section.

Cambrian reservoirs are thought to be present under much of West Central Texas, from Stonewall County southeast to the Llano uplift.

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CALIFORNIA

Richfield Completing New JV Pool Discovery

Richfield Oil Corp. was running casing and liner in its new JV pool discovery between Wheeler Ridge field and Tejon field in southern Kern County. The wildcat, 16-30 Richfield-Mohawk, was originally completed several months ago as noncommercial Pulv sand discovery. The operator then went back and whipstocked and redrilled the 9,777 ft. hole for the JV sand find. The re-completed depth of the well is 7,976-8,103 ft. On a formation test with a 300-ft. water cushion and a 1,200 lb. air cushion the well flowed at a 533 bbl. daily rate of 58.1°-gravity crude through a ½-in. choke. The well is 3 miles east of Wheeler Ridge and 2 miles west of the nearest JV sand production in Tejon field.

Shell Cleaning Out First Santa Fe Springs Offset

Shell Oil Co. was circulating out mud with oil on 29 Slusher, its first offset to Edwards Nepple's recent new pool discovery on the west edge of the Santa Fe Springs field in the Los Angeles Basin. Shell's test was total depthed at 10,150 ft. Meanwhile, Nepple had run into trouble with his first offset. He was on a fish job on stuck drill pipe in his 10,378 ft. offset, 2 SP-Pedro-Nepple. Both Shell and Nepple's offsets are slant-drilled, as was the discovery well, due to the tight surface location situation. The discovery, 1 SP-Pedro-Nepple, was completed for 720 bbl. daily of 34°-gravity crude from 9,443-9,725 ft.

OKLAHOMA

OKLAHOMA PANHANDLE

Inside Hugoton Penn Area Extended South

Panhandle Eastern Pipe Line Co. 1 Smith, NE NE SW 26-4n-13eCM, extended a new pre-Permian producing area inside Guymon-Hugoton field, Texas County. Operator has run casing at the Morrow prospect. A drill-stem test at 6,445-80 ft. recovered 2,200 ft. of oil and 2,000 ft. salt water.

The 1 Smith is 1 mile south of the 1 Wilson, a dual Pennsylvanian discovery. This well, C W½ SE 23-4n-13eCM, flowed 35,525 M.c.f. of gas per day from the Toronto at 4,248-60 ft., and is an oil discovery in the Morrow at 6,441-72 ft.

Phillips Taps Third Permian Sand at Griggs

South Griggs field in the southeastern corner of Cimarron County in rank wildcat country added its third Permian oil zone. Phillips Petroleum Co. 4 Bruere, SW SE NE 31-1n-9eCM, uncovered production in the Wichita-Albany zone at 2,396-2,404 ft. The operator is putting up pump for completion. Other Permian pays in this relatively new field are the Krider and Winfield.

Panhandle Eastern Pipe Line Co. extended its pre-Permian producing area inside Guymon-Hugoton gas field, Texas County, at 1 Smith, NE NE SW 26-4n-13eCM. Panhandle 1 Wilson will dually complete in Morrow and Toronto. In Cimarron County, Phillips Petroleum Co. found a third Permian oil sand in South Griggs field, the Wichita-Albany.

EAST TEXAS

Dual Strike Completed In Harrison County

James E. Kemp et al. 1 Pattie Griffin, wildcat in southern Harrison County, has been completed as a dual discovery. Potentials were calculated open flow.

From Crane (Pettet zone) perforations at 6,522-26 ft., initial potential was 6,800,000 cu. ft. of gas a day, plus 57½ bbl. of distillate per 1,000 M.c.f.

Second pay was the Travis Peak at 6,879-82 and 6,822-25 ft., which rated 2,000,000 cu. ft. of gas, plus 6 bbl. of distillate and 15 bbl. of salt water.

Location is in the P. Lindsey Survey, A-391, 10 miles south of Marshall.

Smith County discovery . . . A long extension to Hitts Lake Paluxy field, or new discovery, has been completed as a good flowing well. Payne-Johnston 1 Black, east-northeast of Hitts Lake field in J. Lane Survey, flowed better than 652 bbl. of oil a day through 18/64-in. choke from Paluxy perforations at 7,079-7,153 ft. Gas-oil ratio was 300:1.

HERE ARE THE HUGOTON embayment province's busiest areas . . . the Oklahoma and Texas Panhandles, Haskell County, Kansas, and the newcomers to the success chart, Woodward and Dewey counties, Oklahoma.

Hugoton Pre-Permian Drive Taps New Deep Reservoirs

by John C. McCaslin
District Editor

THE pre-Permian drive in the Hugoton embayment continues unabated. Hugoton was one of the nation's busiest oil and gas provinces last year, and early 1957 happenings in the four-state region point to a repeat performance. Here is the 1957 record to date:

In the Oklahoma Panhandle . . . For the past several years this region has enjoyed one of the country's highest wildcat and development success ratios. This outstanding score continues strong, particularly in Beaver County.

. . . Lynn Drilling Co. recently opened one of the best new Morrow-Pennsylvanian oil fields in Beaver County in some time at its 1 Williams, SE SE NW 32-1n-20eCM, southeast of big Camrick-Morrow oil and gas district.

The Williams well flowed 450 bbl. of oil daily from the Morrow sand at 7,276-7,307 ft. Location of this new field is in the extreme southwestern part of the county, just north of the Texas line. It lies in an area of several other good Morrow fields—Boyd, Dower, Northwest Dower, Gray, and East Camrick.

Carter Oil Co. closed the producing gap between the Lynn well and Camrick field itself in February at 1 Lehmann Unit, NW NW SE 30. Carter's Morrow success flowed 224 bbl. of condensate plus 8,250 M.c.f. of gas per day.

. . . Phillips Petroleum Co. has a Chester - Mississippian discovery at 1 Blakemore, 9 miles northwest of production in western Beaver County.

This remote wildcat tested the Chester at 6,524-58 ft., recovering 5,780 ft. of 36° A.P.I. oil. The wildcat is going on down to its 9,000-ft. objective, making it one of the deepest tests going in the Panhandle country.

. . . Shell Oil Co. established possible Chester gas production in Northwest Highland field at its 1 Barby, NW SE 6-3n-28eCM, eastern Beaver County, but plugged back to the Hoover-Pennsylvanian at 4,350-4,410 ft. to complete in this, the regular field pay. The Chester gas flow was 1,300 M.c.f. per day; the Hoover flow was 3,770 M.c.f. per day.

Beaver County still remains as the Hugoton province's busiest pre-Permian area. There are 9 wildcats drilling and 14 field wells. Next in line is Morton County, southwestern Kansas, with 1 wildcat and 12 field wells. Harper County, Oklahoma, has three wildcats going and nine field wells.

In Northwest Oklahoma . . . This section of the northwestern Anadarko basin has been the scene of real wildcat news in recent weeks. Last year's success in the Laverne district of Harper County plus the opening of Morrow production in previously nonproducing Woodward County shoved this section of Oklahoma into the black. The big news out here is yet to come.

. . . Harper County. The year's first hit for Harper County came at Eason Oil Co. et al 1 Price, 21-26n-23w. Production is from the Tonkawa-Pennsylvanian at 5,500 ft.

Eason's discovery well is southeast of Stockholm gas field production and east of the growing Laverne district. The Harper play has been hot for over a year. Acreage is getting scarce, and prices are going up on what is left.

. . . Woodward County. The exploratory highlight of 1956 in northwestern Oklahoma, Union Oil Co. of California 1 McCormick (a Morrow gas-condensate strike), was confirmed early this year. Tidewater Oil Co. 1 Church, SE SE SW 11-22n-20w, southeast of Woodward, flowed 3,638 M.c.f. of gas per day on 21/64-in. choke from perforations in the Morrow at 8,219-34 ft. on final test. Calculated open-flow potential was 4,650 M.c.f. per day.

Confirmation of Union's important Morrow find is good news for the oil hunters in northwestern Oklahoma. Tidewater's confirmation success gives the green light to an expected big push into the wide open oil country of Woodward, Dewey, Ellis, and other northwestern counties.

. . . Dewey County. This oil-barren county fell before the drill shortly after Woodward's success. Sinclair Oil & Gas Co. 1 A. M. Kunc, 8 miles southwest of Taloga in C SW NE 11-17n-18w, was completed in January flowing 67 bbl. of 48.5° A.P.I. oil

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in 8 hours through perforations in the Oswego lime (Pennsylvanian) at 9,159-93 ft. and 9,201-13 ft. The closely watched wildcat went to 14,467 ft., total depth. Shows were reported on tests of the Cherokee - Pennsylvanian lime at 9,284-92 ft.

In the Texas Panhandle . . . The deepest and most remote wildcatting in the Hugoton province is going on in the northeastern part of the Texas Panhandle — in Lipscomb and Hemphill counties.

. . . A deep 16,000-ft. wildcat in Hemphill County, 10 miles northeast of Glazier in Section 43, Block 12, H&TC Survey, recently became the Panhand's deepest hole at 15,997 ft. in the Ellenburger.

Magnolia Petroleum Co. 1 D. D. Feldman is having trouble with fish, but earlier the operator tested gas in the Tonkawa at 7,562-7,608 ft., in the Morrow at 11,433-11,531 ft., and in the Marmaton at 9,045-9,150 ft. If the well should find commercial gas production in the Morrow zone, it would also become the deepest producer in the Texas Panhandle. This honor presently goes to Laketon-Delp Ellenburger field in Gray County.

. . . No. 3 for Lipscomb. Humble Oil & Refining Co. gave Lipscomb County its third producing field early in February at 1 R. H. Cowan, 1¼ miles southwest of Lipscomb town in the central part of the county.

Production at this field-opener is from Morrow sand at 10,144-64 ft. The well flowed 11,000 M.c.f. of gas per day plus 6 bbl. condensate per million. Location is in Section 545, Block 43, H&TC Survey. The county has one oil field, Merydith, and another gas field, Miller. Both are Morrow producers at great depths. In fact, the Morrow production in this county is the deepest from that pay zone anywhere.

In Southwest Kansas . . . Inside Hugoton field discoveries continue to pop up in southwestern Kansas. The latest addition to the growing pre-Permian patchwork inside the vast Permian gas producing area is Trees Oil Co. and Associates 1 Moore, C NW NW 21-30s-34w, 3 miles west of Satanta in Haskell County. The Moore discovery swabbed and flowed 1,000 M.c.f. of gas per day and 15 bbl. of oil per hour from the Morrow sand at 5,370-80 ft.

Southwest Kansas boasts the biggest number of inside Hugoton field deep fields. Most of them have been opened in the past 3 years. They are: Pleasant Prairie, South Side, Beyers, Northwest Pleasant Prairie, Panoma, Holt, Shuck, Wide Awake, and Hanke.

ROCKY MOUNTAIN

NEVADA

Brown Quits Las Vegas Deep Wildcat

Joe W. Brown has given up on 1 Wilson-Federal, an 8,509 ft. wildcat located 5 miles south of Las Vegas. This was the deepest test drilled in southern Nevada.

In other Nevada activity, U. S. Oil Co. was pumping all water from the 2,026 ft. 1X Wilson 15 miles southwest of Las Vegas. Just 1 mile north of 1X Wilson, Matador Oil Co. has a location staked for a wildcat in 29-33s-60e. Matador was also getting ready to swab an old well 16 miles southeast of Las Vegas. Moapa Oil & Gas Co. 1 Logandale in SW SW 21-15s-67e, was standing cemented with 12-in. casing at 520 ft.

Standard Oil Co. of California will drill 1 County Line Unit in NW NW 19-10n-62e. This is in White River Valley in White Pine County. It will be a joint test with Shell Oil Co. on a 16,075 acre unit in White Pine and Nye counties. The drill site is 27 miles northeast of Shell's Railroad Valley production and 38 miles southwest of the town of Ely. Seven other companies own varying interests in the unit.

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MONTANA

Amerada Recovers Oil At Outlook Area Well

Free oil was recovered last week at Amerada Petroleum Corp. 1 Loucks, C NE SW 35-36n-52e, Sheridan County. The operator got 72 ft. of free oil on a test in the Silurian at 9,228-40 ft. Recovery was 1,830 ft. of oil and gas-cut water cushion and 680 ft. of oil and gas-cut mud. This wildcat is the second Outlook area well. The discovery, 1 Tange, was completed flowing 2,742 bbl. of oil daily from Silurian at 9,056-74 ft.

Amerada has another well in the area, the 1 Ruegsegger, C NE NE 24-36n-52e. Coring is below 9,480 ft.

UTAH

Best Gage Yet Recorded In Booming Aneth Area

Southeastern Utah's Aneth area tapped its best flowing Pennsylvanian well yet. The Texas Co. completed its 6 Navajo-C, W½ NW NE 25-40s-24e, San Juan County, for a daily gage of 3,462 bbl. from two zones in the Pennsylvanian. Perforations at 5,602-20 ft. netted 1,806 bbl. per day on 1-in. choke. The company calls this zone the Ismay. From perforations at 5,752-88 ft. the flow was 1,656 bbl. per day on 1-in. choke. This zone is the Aneth pay. This is the first multiple-pay completion at Aneth. Location is ¾ mile south of Aneth field proper.

TEXAS

WEST CENTRAL TEXAS

Runnels County Discovery Flows Gas-Distillate

Runnels County gained a gas-distillate discovery at Karl Hoblitzelle 1 Lester Lee, 3 miles south of Norton. On final test it made a calculated 3,970,000 cu. ft. of gas per day, plus 18 bbl. of distillate.

Pay is the Odom limestone, perforated at 4,770-74 ft. Location is in Section 22, H&GN Survey.

Knox County . . . Location has been made for a 5,600-ft. wildcat in southeastern Knox County by Charlie Grace Drilling Co. The well will be 1 Elizabeth Friske, 9 miles north of Munday in Section 11, Block 20, D. G. Burnett Survey, A-8.

Nolan County . . . Sun Oil Co. 1 Bessie Hollins, 4½ miles northwest of Sweetwater in 29-22-T&P, has been completed as a Canyon sand discovery. Initial potential was 54 bbl. of oil a day through ¾-in. choke, from pay at 5,752-60 ft. Location is 1½ miles north of Roscoe-Strawn field.

WEST TEXAS

Devonian Pay Added to South Keystone Field

Winkler County, on the western side of Central Basin Platform, gained another pre-Pennsylvanian discovery in the area northeast of Kermit. The well is Gulf Oil Co. 181 Keystone Cattle Co., Section 29, Block 12, PSL Survey. Location is in South Keystone field, 6½ miles northeast of Kermit.

On initial test of the Devonian at 8,640-8,760 ft., gas surfaced in 7 minutes, at the rate of 1,757 M.c.f. Gage on the oil was 300.5 bbl., plus 33 bbl. of water, in 4 hours and 28 minutes. Choke size and pressures were not reported. Drilling continued below 9,161 ft.

Regular production in South Keystone field is from the Tubb zone, at an average depth of 6,470 ft. Nearest Devonian production is 3 miles to the northwest.

Shell Oil Co. 1-17-A University, Delaware basin prospect 5 miles southwest of Wink, is continuing tests of the

...under all conditions

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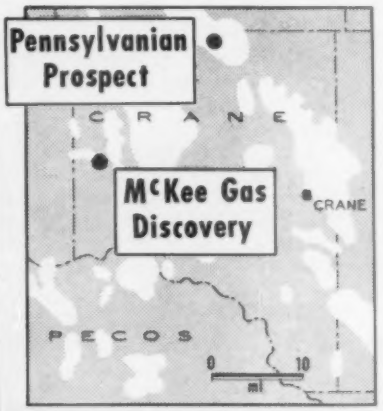
Pennsylvanian. Operators prepared to squeeze perforations at 13,600-40 ft. when gas flow declined from 125,000 cu. ft. to 120,000 cu. ft. per day through 1-in. choke. Flowing pressure was 50 psi. Another report on the same perforations credited the well with 395,000 cu. ft. per day through 22/64-in. choke immediately following acid treatment, which decreased to 78,000 cu. ft. per day, plus 10 bbl. of condensate and 47 bbl. of water.

Crane discovery completed . . . Gulf Oil Corp. has completed a Pennsylvanian opener in the northwest portion of shallow Waddell field, 7 miles southeast of Judkins in Crane County.

The new pay discovery is 101 M. F. Henderson, in Section 5, Block 23, PSL Survey. Potential on the pump was 135 bbl. of oil a day from perforations at 7,345-7,420 ft.



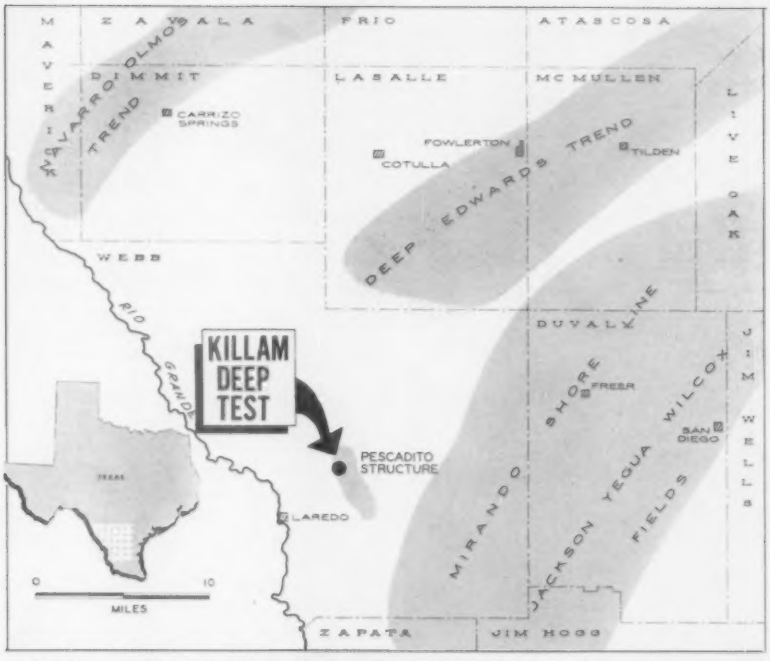
McKee gas discovery is Gulf Oil Corp. 447 Waddell, on the east side of West Sand Hills field. Completion tests were under way. Pennsylvanian prospect is Gulf 101 Henderson, in shallow Waddell field, completed for 135 bbl. of oil at last report.

KANSAS

SOUTHWEST KANSAS

Kiowa Stepout Tests Oil and Gas Shows

Testing is due at a wildcat 1¾ miles southeast of Alford pool in southern Kiowa County. Honaker-Davis 1 Kane, SW SW SW 18-30s-18w, 12 miles south of Greensburg, gaged 1,450 M.c.f. of gas per day on a drill-stem test of the Mississippian at 5,000-15 ft. Recovery was 75 ft. of gas-cut mud. Another test at 5,015-37 ft. made 734 M.c.f. per day with recovery of 130 ft. gas-cut mud. The last test at 5,037-54 ft. recovered 70 ft. of slightly oil and gas-cut mud.



PESCADITO STRUCTURE, in South Central Webb County, Texas, where Ginther, Warren & Ginther are starting deep Edwards wildcat on Killam block.

New Deep Edwards Test Stirs Texas Wildcat Speculation

Pescadito structure may produce a new deep Edwards extension near the border

by Neil Williams
Associate Editor

STARTING of an ultradeep test on the Pescadito structure in Southwest Texas' south-central Webb County not only stirs interest in a prominent and long-recognized, but so far unproductive geological feature that has teased wildcatters many years, but stimulates speculation on the possibilities of another major extension of the deep Edwards play southwestward from LaSalle and McMullen counties.

Ginther, Warren & Ginther, of Houston, are operators on the test, located on a large block of leases and minerals held by O. W. Killam, pioneer independent operator, of Laredo. Actual drilling is by Dillard & Waltermire, contracting firm of Houston, using a heavy-duty Gulf Coast drilling rig moved in from the Houston area, where it recently completed an 18,000-ft. wildcat test.

Permit for the test provides for drilling to a depth of 17,500 ft., sufficient to take the hole well into the Edwards formation, possibly below it. Nearest other Edwards drilling has been more than 35 miles north in southwestern LaSalle County. There, at Stuart City, Pan American Petroleum Co. (formerly Stanolind Oil & Gas Co.) has several gas wells completed in the Edwards zone, at depths of 10,000 to 10,300 ft. It is the most southwesterly production so far on the deep Edwards play.

Pescadito test is 14 miles northeast of Laredo and the Mexican border (Rio Grande). It is on the Ortiz Ranch, where Killam acquired the mineral rights several years ago. This, with the adjoining Manuel Benavides Volpe Ranch, recently leased by Killam, and other previously held leases and minerals, gives Killam virtual control of almost the entire structure.

Location, in Section 1806, GC&S Survey, on the Novillos Pasture lands, is near what is outlined as the crest of the structure. It is about a mile south and a little east of the structure's previous deepest test, drilled by Brewster & Bartle and others in 1950 and 1951. That test reached a total depth of 13,704 ft., and reportedly was in the Georgetown when abandoned.

The Pescadito structure is a large ovate domal uplift 7 to 10 miles long, from north to south, and about 4 miles wide, east to west, at its widest point. It has an average surface elevation of about 725 ft., and is about 1,000 ft. high on the Wilcox. Surface formation is Yegua. Subsurface Carrizo is at 3,000 to 3,250 ft. on structure.

First drilling on the structure was started late in 1935. The initial test was abandoned in January 1936 at 3,200 ft. in Carrizo. Altogether, about 20 tests have been drilled. Except for Brewster & Bartle's 13,704-ft. test, all have been quit above 7,000 ft., the majority in the 3,000 to 4,000-ft. range.

Many different companies and operators have participated in the drilling. These include Killam, Humble Oil & Refining Co., Seaboard Oil Co. of Delaware, Union Oil Co. of California, in addition to Brewster & Bartle (and Gillespie & Sons) and the present operators.

Although no commercial production has been uncovered, numerous shows of oil and gas have been logged. These have been in the Tertiary section, principally in the Wilcox at 3,750 to 3,900 ft. in a 4,600-ft. zone.

CANADA

ALBERTA

Here Are Test Details At Red Earth 11-21

Production test details were released by Union Oil Co. of California at 11-21 Red Earth Creek, LSD 11, 21-87-8w5, the second follow-up well to the 12-17 Red Earth discovery, completed in February 1956.

. . . First day, Flowed 252 BOPD, 8-hour test through 6/64-in. choke. Gas-oil ratio 169 cu. ft. per bbl.

. . . Second day. Flowed 228 bbl. of oil on 24-hour test through 12/64-in. choke. Gas-oil ratio was 305.

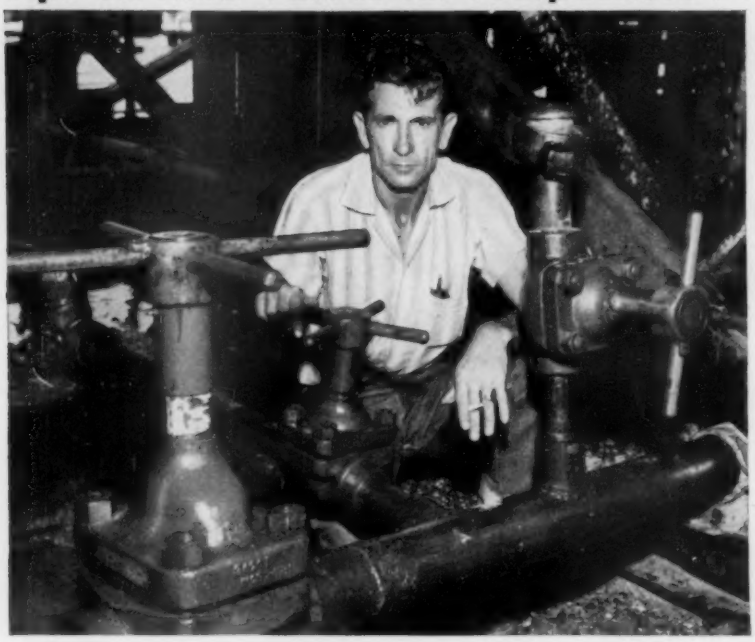
. . . Third day. Flowed 189 bbl. of clean oil on 24-hour test, 12/64-in. choke. Gas-oil ratio was 172.

. . . Fourth day. Flowed 255 bbl. of oil on 14/64-in. choke on 24-hour test. Gas-oil ratio was 208.

. . . Fifth day. Flow was 255 bbl. on 14/64-in. choke, 24-hour test. Gas-oil ratio was 208.

The 11-21 well is 1¼ miles east and

Tips on Mud Valves for Toolpushers . .



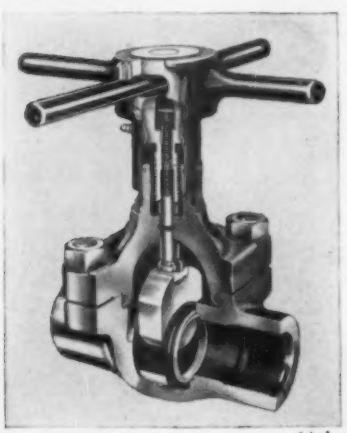
Bob Walker stops to look over a few of the MUDWONDER mud valves during rigging.

Veteran Oil Drillers Agree On MUDWONDER For Mud Valve Economy

By Robert Walker, Toolpusher, Rig #2
J. & B. Drilling Company, Eunice, Louisiana

WHEN your crew swears one mud valve is the best and the price tag is in line with other valves, logic says buy them. And, that's just what we did.

MUDWONDER cut-away view shows the double thread construction, separated stainless stem and hard chromed gate with "T" slot connection and the one-piece seat insert with the buna-N molded integrally over the steel wear rings.



Rockwell-Built MUDWONDER valves were put on all mudlines when the new "76" was rigged recently.

Past experience had proven the MUDWONDER valves as near trouble-free as a mud valve can be. So, it wasn't a difficult choice. Our vice-president, C. E. Bush, a veteran well digger, agreed that in sharply competitive contracting, J. & B. could not afford inferior valves.

The easy MUDWONDER operation, even at high pressures, and the long service life make it truly an "economy" valve. On the rare occasions when maintenance or inspections—even part replacements—are required, no drilling time need be lost. Mud valve work can be done while the crew makes a connection because the one-piece body stays in the line.

Two-inch and 4-inch MUDWONDER valves are being sent on our standpipe, mud guns, manifold, bleed-off, etc., with great success. Mr. Bush and the crew join in recommending MUDWONDER to any toolpusher having mud valve problems.

MUDWONDER valves are built in 2", 3", and 4" sizes with screwed or flanged ends for 2000 psi WP (4000 psi test) and 3000 psi WP (6000 psi test).

Your favorite oil field supply store can give you complete information or write Edward Valves, Inc., East Chicago, Ind.

(Advertisement)

1 mile north of the discovery well of the field. It is 1 mile north and ¼ mile east of the second well in the field.

Winter Drilling In High Gear

Winter drilling activity is at a high pitch in northwestern and northern Alberta and in northeastern British Columbia. Exploratory events since the first of the year in this vast region include:

. . . Development of Red Earth Creek-Granite Wash field.

. . . Gas discovery at East Peace River in far northern Alberta.

. . . New development at Normandville.

. . . New Devonian pays in South Sturgeon Lake area.

. . . Gas discoveries of note at Virginia Hills, East Kaybob, Silver Creek, and Pine Creek.

. . . Another oil success in Boundary Lake area of British Columbia.

. . . Additional gas reserves added to Halfway Lake and Blueberry River fields.

. . . Thirty rigs working in British Columbia for new provincial record.

Red Earth Creek . . . The long awaited development of Red Earth Creek field in northern Alberta began this winter.

Union Oil Co. of California, Ltd., added the third well to the Granite Wash field in January at 11-21 Red Earth Creek, LSD 11, 21-87-8w5, 1 mile north and ¼ mile east of the field's second well, 12-16, completed for 168 bbl. of oil per day late last year, and 1¼ miles east and 1 mile north of the 12-17 discovery well, one of the most significant and newsmaking strikes in western Canada's wildcat history.

The 11-21 extension well flowed oil at 4,762-82 ft. More development drilling is expected in this area until the muskeg thaws in the spring.

East Peace River . . . Hudson's Bay Oil & Gas Co. and Union Oil Co. of California, Ltd., 2 East Peace River, LSD 7, 34-94-18w5, flowed about 1,000 M.c.f. of gas per day on a drill-stem test of the Basal Quartz zone at a shallow depth. The well is drilling on toward its pre-Permian objective.

Normandville . . . Colorado Oil & Gas, Ltd., operator of an exploratory and field-development program in the Normandville area of northwestern Alberta, completed two oil wells in the D1 recently. These new producers are the first to produce from this particular zone of the Devonian in this area. They are located north and east of the 1 Normandville D3 zone of the

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Devonian oil discovery which set off the current campaign.

Colorado-Okalta et al 4-15 Normandville, LSD 4, 15-79-22w5, flowed about 200 bbl. per day from the D1. The 8-16 Normandville flowed 200 bbl. per day from the same zone.

Sturgeon Lake region . . . This section of Alberta, which has one of the province's largest proven reserve of D3 reef oil, added production from the D2 formation and the Winterburn dolomite (another Devonian pay) during the early weeks of the new year.

Amerada Petroleum Corp.'s 1-20 Crown "R," LSD 1, 20-69-22w5, is the new D2 producer prospect at South Sturgeon Lake. The operator tested oil from the D2 zone, but went on down to the D3 for completion. Hudson's Bay 3-5 Liberal, 6½ miles southeast of Amerada's well, had good recoveries of oil in the Winterburn dolomite.

These two indicated new-pay discoveries bring to five the number of possible and actual oil pay zones in the area . . . the Triassic, Rundle, D3, Winterburn, and D2. There is also prolific gas production in the area from the D1 zone.

Virginia Hills . . . Home Oil Co. et al tested Slave Point-Devonian at 9,228-58 ft. at the 9-20 Virginia Hills wildcat, 115 miles northwest of Edmonton.

The well, located on LSD 9, 20-65-12w5, flowed gas at the rate of 3,000 M.c.f. per day with a spray of oil. Recovery was 5,000 ft. of light-gravity oil. Additional core at 9,259-84 ft. recovered 25 ft. of porous lime with oil and gas shows. A drill-stem test of this interval recovered 1,200 ft. of oil, no water. There is 57 ft. of pay. This wildcat appears to be a discovery in the Slave Point-Devonian which was first found to be productive in northwestern Alberta's Springburn field, 94 miles north-northwest of Virginia Hills.

The well is being drilled by Home to earn one-third interest in Virginia Hills block which Union and Hudson's Bay each have one-third interest.

The wildcat found gas in the basal Blairmore formation, flowing up to 5,100 M.c.f. per day. Objective is the pre-Permian.

Pine Creek . . . Hudson's Bay Oil & Gas Co. et al 1 Pine Creek, LSD 2, 10-58-19w5, near Edson, and 27 miles southwest of Windfall field, tested gas-distillate from 52 ft. of reef topped at 11,310 ft. Gas flowed at the maximum rate of 10,000 M.c.f. per day during tests of the D3 Devonian zone. A later test made 3,000 M.c.f. per day.

East Kaybob . . . Hudson's Bay and Union Oil Co. of California completed the East Kaybob discovery in the Viking sand, flowing 3,500 M.c.f. per day. The well also showed for production in the basal Cretaceous.

This wildcat discovery is 50 miles north of Edson and 22 miles northwest of Windfall.

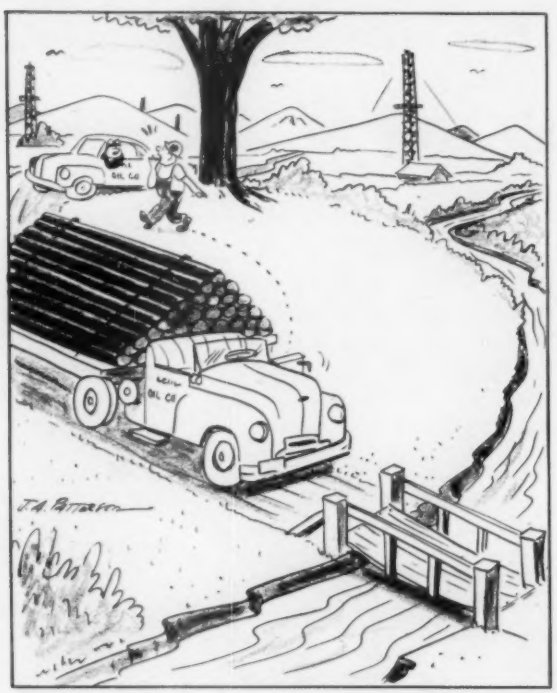
Silver Creek . . . Fina et al 15-25 Silver Creek, northwest of the Windfall area on LSD 15, 25-60-16w5, tested 10,000 M.c.f. of gas daily in the D3 Devonian zone. Condensate was also reported at this wildcat.

BRITISH COLUMBIA

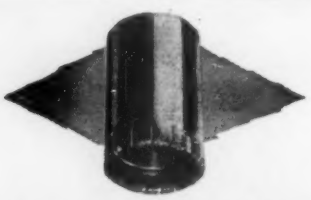
Boundary Lake . . . Imperial-Pacific 1 Boundary Lake, LSD 11, 19-85-14w6, is a possible 5-mile southwest extension to Boundary Lake field oil production. The well tested oil in the Triassic, the pay at the field. Recovery on one test was 810 ft. of gassy oil.

Boundary Lake is the only single oil-producing field in British Columbia. There is some oil production inside the Fort St. John gas field.

The province is now in its busiest drilling period in history. Additional gas reserves are being added to the many old and new fields in the northeastern part of the province . . . Fort St. John, Halfway Lake, Blueberry River, and others. In January there



"Boss, you know that bridge you always say we'll cross when we come to it? Well, we've come to it."



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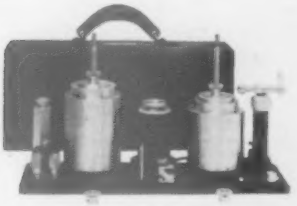

The only truly portable dead weight tester of this capacity

An extremely compact instrument for pressure gage testing and calibration to pressures of 5,000 psi. Standard Accessories include an adaptor so the tester may also be used as a dead weight gage. Can be furnished in ranges of 5-1000 psi or 50-5000 psi.

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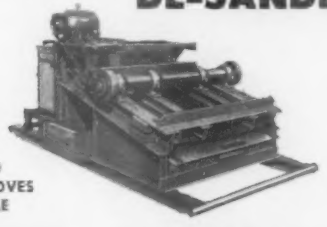

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were 27 rigs working this gas-producing region. A shift toward oil exploration is expected in this province this year.

MICHIGAN

Wayland Traverse Dscovery Completed

New Wayland Township Traverse oil discovery well, Ford Henry and Jack Hobson 1 Cook, SE SW SE 6-3n-11w, Allegan County, was completed for a restricted pump rate of 40 bbl. of oil per day. Wildcat logged top of Traverse lime at 1,694 ft. Pay was drilled between 1,699-1,712 ft., total depth. Through February 14, 1,200 bbl. of oil had been sold from this discovery.

On the basis of well's stuctural position and its present production record, this new wildcat appears to be the most significant shallow discovery well in southwest Michigan in several years.

● First follow-up test, of the first two drilled, to show for possible commercial completion in Berea sand in the Marathon township pool, Lapeer County, was being tested at DuLong Oil Co. K-1 Newcombe, NE NW SW 10-9n-9e.

This well logged Berea gas pays at 1,446-48 ft. and at 1,456-58 ft. Well was gaged good for 289,000 cu. ft. of gas a day at 1,458 ft., total depth, before long string had been run. Top of Berea was logged at 1,445 ft.

The K-1 Newcombe is one 10-acre location north and four locations west of John W. Johnson 1 Clemons Berea oil discovery well.

● Best "sour" zone oil producer in Reed City pool, Osceola County, was under test at C. W. Jetter 1 Bauer, N½ SE SW 5-17n-10w, Richmond Township, Osceola County, flowing at a restricted rate 15 bbl. an hour after pays between 4,141-99 ft. were perforated and acidized with 5,000 gal. Well is bottomed out at 4,235 ft.

This advertisement is neither an offer to sell nor a solicitation of offers to buy any of these securities. The offering is made only by the Prospectus.

NEW ISSUE

February 8, 1957

$171,720,200

Phillips Petroleum Company

4¼% Convertible Subordinated Debentures due 1987

Holders of the Company's outstanding Common Stock are being offered rights to subscribe at 100% for the above Debentures at the rate of $100 principal amount of Debentures for each 20 shares of Common Stock held of record on February 7, 1957. Subscription Warrants will expire at 3:30 P.M., Eastern Standard Time, on February 25, 1957.

The several Underwriters have agreed, subject to certain conditions, to purchase any unsubscribed Debentures and, both during and following the subscription period, may offer Debentures as set forth in the Prospectus.

Copies of the Prospectus may be obtained from any of the several underwriters, including the undersigned, only in States in which such underwriters are qualified to act as dealers in securities and in which the Prospectus may legally be distributed.

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Lazard Frères & Co. Lehman Brothers Merrill Lynch, Pierce, Fenner & Beane

Smith, Barney & Co. Stone & Webster Securities Corporation White, Weld & Co.

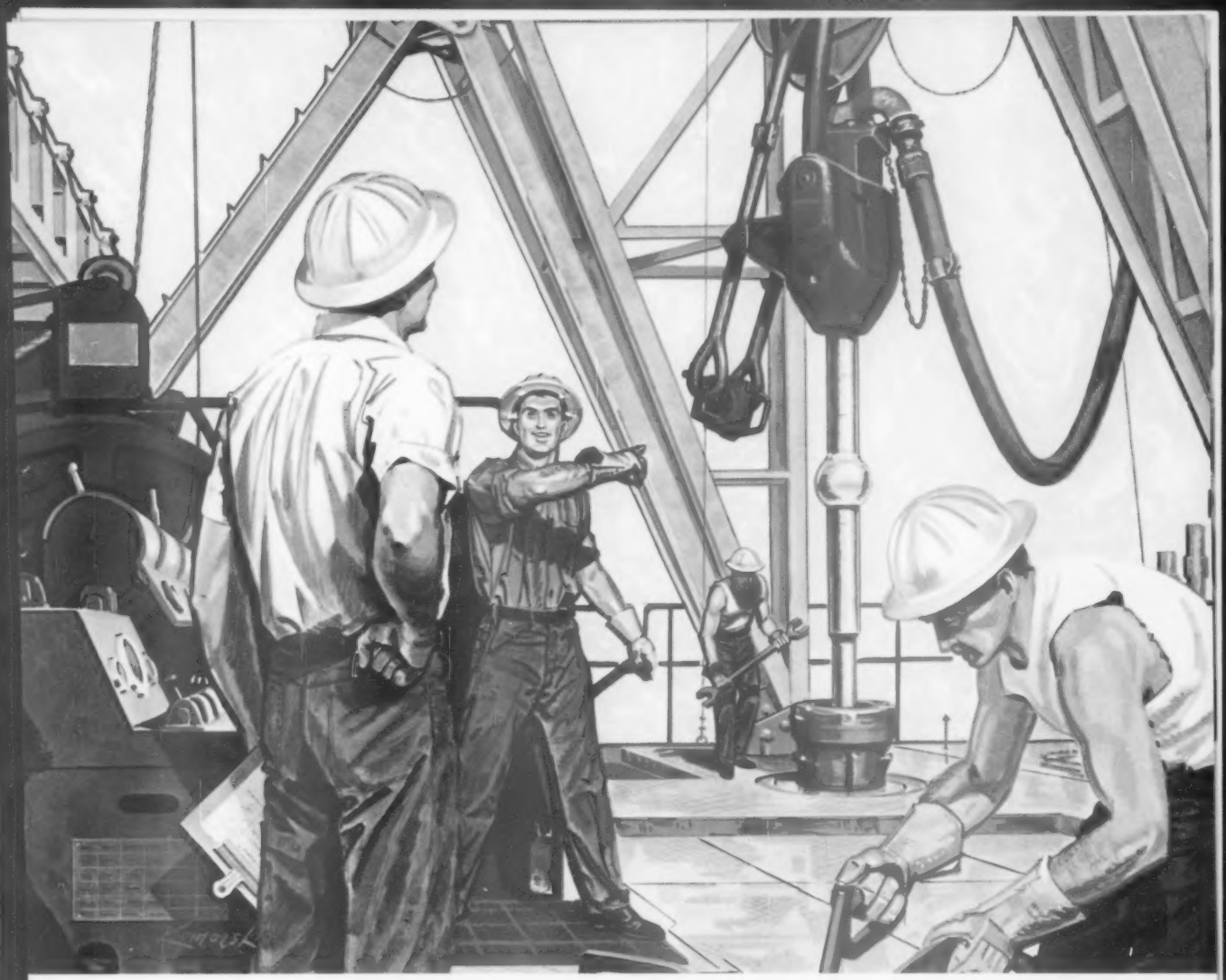
Map Review

Midland Map Co. has issued two new oil field maps on the Permian basin. Their Development Map of the Permian Basin uses color to show field growth by year, starting with 1952. The base map measures approximately 21 by 36 in. Field development prior to 1952, counties, basins, principal towns and highways are in black and white. Starting with the year 1952, each year's field development is shown in a different color. In area it covers the Permian basin in West Texas and Southeast New Mexico.

Permian Basin Field Map, 1957 edition, in 21 by 36-in. size, shows oil or gas fields, counties, principal towns and highways in blue and white. Outlines of basins, channels, uplifts, and other geological features are printed in red.

NORTH DAKOTA

W. A. Hanlon and L. J. Williamson have an indicated Mission Canyon-Mississippian oil discovery in Ward County, 40 miles east of Nesson anticline fields. The 1 Knudtson, NE SE 7-157n-87w, recovered 270 ft. of heavily gas-cut oil on a drill-stem test at 6,732-95 ft. Success at this wildcat would open first production in the county in an area of very little previous drilling.



National Swivel users tell "best service records"

Two outstanding performance reports on National Swivels recently came in from widely separated locations. Here's what a user in faraway India told us:

"We have just completed our first test well which went down to 13,739 feet. On completion of the well, the National Swivel had done 1653 hours without any leaks from the Uniflex wash pipe assembly. This is certainly the best performance we have had from a particular wash pipe assembly. We intend to use it to drill No. 2, to see how many more hours it will do."

Then here's what a user in Illinois told us about a National Swivel he bought in 1953:

"With the original wash pipe and packing, 37 wells, ranging from 2,046 to 3,380 feet, and totaling 104,195 feet, were drilled. The second set of wash pipe and packing lasted for the drilling of 28 wells, totaling 85,157 feet!"

The tool pusher for the customer at this Illinois rig location said that this is the best service record he has ever encountered for wash pipe and packing on any swivel.

On the next two pages, you can see the design and construction reasons why National Swivels establish records like these. Whether it's drilling machinery, production equipment or general supply service, remember that National Supply is always ready to meet all your needs with the best you can buy. This is true whether you're operating in India or Illinois, Somaliland or Texas. Try us soon and see.

THE
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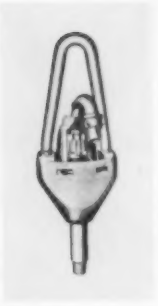
National brings you 6 big advantages in Type N Swivels!



1 Reduced weight

Complete redesigning has been employed to bring every model down to minimum weight in relation to individual rated capacity. The use of high quality, high-strength components throughout has reduced both over-all height and weight to greatly facilitate handling.

2 Lower center of gravity

Centerline of the bail pins on Type N Swivels has been raised, thereby lowering center of gravity. This means greater stability in handling, makes connection of swivel "sub" to kelly easier and faster.

3 Streamlined exterior

The one-piece steel body is free from any dangerous projections. All bolts, nuts, pins and grease fittings are recessed to assure maximum safety to the derrick crew.

4 Fast wash pipe replacement

National's exclusive Uniflex Wash Pipe Box assembly is standard on all Type N Swivels. Its Nationaloy wash pipe is of the free-floating type. The packing assembly has inverted rings and provides an improved method for packing off the mud. The Uniflex assembly also has quick-acting threads to speed replacement, is easily assembled by one man, can be installed without removing the gooseneck or breaking the hose connection.

5 Rapid hose coupling

Also standard on all Type N Swivels is the Quick-Seal Hose Connection that speeds make-up of hose joints. All parts are made of steel, and are plated to minimize corrosion and galling of threads. Besides eliminating one hose connection member and therefore minimizing the chance of mud leakage, the Quick-Seal Connection features larger, quick-acting threads and sealing elements to withstand rugged use.

6 Precision main bearing

This bearing is the perfected result of 40 years of National experience in design, manufacture and field performance. Made of highest quality steel, it is precision-machined throughout, and constructed to withstand the extreme loads and high rotating speeds found in modern drilling. A patented spherical contour on the outer end of the rollers draws lubricant between roller and race plate to minimize friction and wear.

There's a Type N Swivel for every drilling job!

Whatever the drilling job, there's a Type N Swivel to economically suit your needs. Check the chart on the right, and get more information on your choice from a National Supply representative.

Type	Depth Range, Feet	Comparative Dead Load, Tons
N-24	2,000- 4,000	110
N-35	3,000- 5,000	150
N-47	4,000- 7,000	200
N-69	6,000- 9,000	300
N-815	8,000-15,000	400
N-1324	13,000-24,000	500

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You can count on safe, fast block action when you choose from National's complete line of Hook Blocks and Traveling Blocks. Every block is engineered for maximum safety, built for long service and thoroughly field-tested under rugged conditions. As outstanding results of National Supply's long experience in the manufacturing and testing of blocks, you get the quality features listed below:

SPECIAL HOOK FEATURES

- Hook body mounted on tapered roller bearings
- Elevator link supports equipped with positive retaining links
- Automatic-latching hook tongue cannot be accidentally opened
- Spring-actuated 8-position rotation lock
- Grooved hook body facilitates drill pipe alignment with elevator

TRAVELING BLOCK FEATURES

- Sheaves independently mounted on tapered roller bearings
- Individual lubrication to each sheave bearing
- All parts securely locked for safety of men working below
- Streamlined—all nuts, bolts, pins and fittings recessed
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Your National representative can give you more information about National Hook Blocks, Traveling Blocks and companion Crown Blocks. Ask him today about the units best suited for your drilling program.

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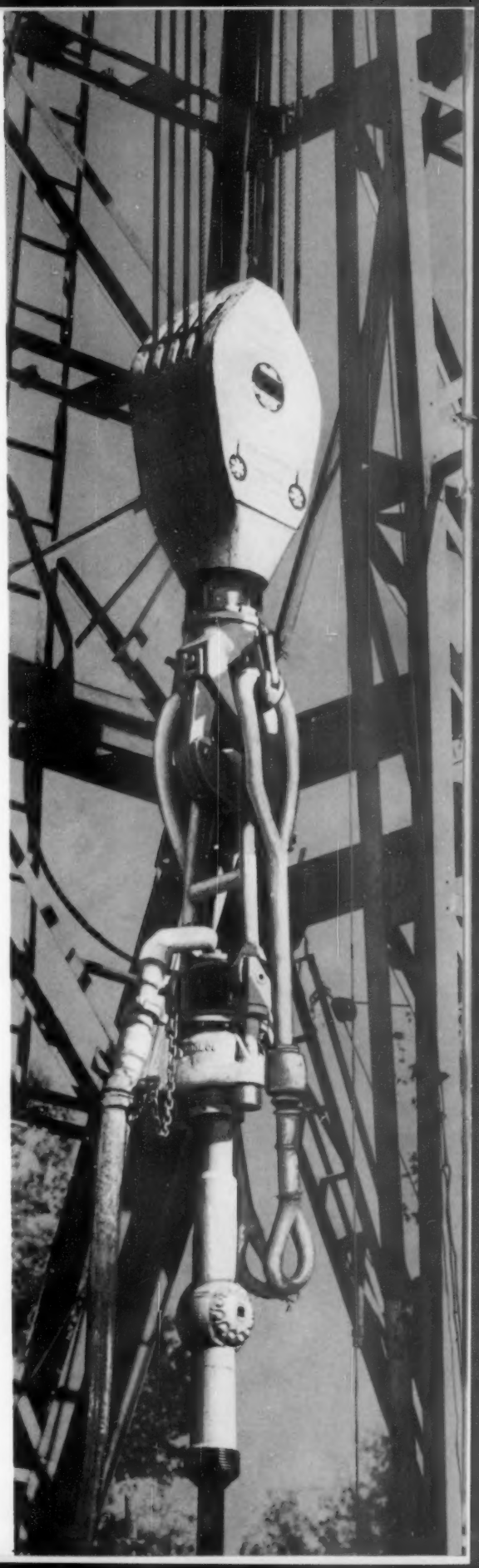


A. V. DANNER, Mobil Overseas president, finds his job complicated by world tensions with . . .

Suez Headache His Problem

ONE wall of a modest but well-appointed office on the twenty-seventh floor of a new Manhattan office building bears a framed original of a cartoon in which the central figure is a tortoise. It carries the caption, "Observe the turtle. He makes progress **only** when his neck is out."

The cartoon isn't new. Arthur V. (Art) Danner has had it a long time and in several offices. Today, he's a little hesitant about committing himself fully to the cartoon's sentiment.

As president of Mobil Overseas Oil Co., Inc., Danner deals daily with all the problems of a fully integrated company. His problems are complicated by the fact that his operations are scattered over half the globe and laced liberally with both international and local tensions and politics.

When Mobil Overseas was set up just a little more than a year ago by Socony Mobil Oil Co., Inc., it inherited a big share of Socony's foreign operations. Socony retained its interests in producing companies operating in the Middle East. The parent also kept its Canadian and South American producing subsidiaries separate. The same was true of Socony's half-interest in Standard Vacuum, which operates generally in the area "east of Suez." The rest is Mobil Overseas.

Legal chemist . . . Danner was a vice president and a director when Mobil Overseas was formed January 1, 1956. Just 11 months later he became president.

A tall, quiet Hoosier, Danner was born in Vevay, Ind. He attended Indiana University, but received his B.S. in chemistry from George Washington. He later received an LL.B. from New York University. He is a member of the bar of New York State and of the District of Columbia.

This double-threat, legal-technical education has been a definite asset to Danner in his climb through Socony's ranks. It's an unusual combination, but Danner says it stands him in good stead.

"When I'm in a technical group, I can say I'm a lawyer. When I'm mixed up with lawyers, I can shrug and insist I'm a technical man," he explains with a grin.

He went to work for Socony in 1937 as a patent agent and patent attorney. From 1942 to June of 1944 he was on loan to the office of Petroleum Coordinator and Petroleum Administration for War.

Four months after returning to Socony he moved again. This time his technical education got the bid. He became executive vice president of Houdry Process Corp. when Socony owned a substantial interest in it.

Danner spent 4 years with Houdry and then returned to Socony to manage the company's process-promotion division. Formal education in chemistry, whetted by 4 years work with the refining process firm, became extremely valuable. This education and experience plus his legal learning tailored him perfectly for the job of handling the licensing of Socony's processing units to other companies throughout the world.

Now a commuter . . . His varied work for Socony has always kept Danner on the move, but the first year with Mobil Overseas meant really traveling to get acquainted with his newly acquired responsibilities. Mrs. Danner and son, Arthur, Jr., were pretty well accustomed to the traveling before it began in earnest.

Now Mobil Overseas' president has settled down to commuting between Socony's new steel-clad building in midtown Manhattan and the Danner home in Summit, N. J.

As president of an integrated and foreign unit of Socony's operation, Danner heads an office staff of 450 in New York which oversees, coordinates, and advises more than 25,000 employes scattered over half the world. Danner looks at the job as "coordinating and advisory" rather than directory. Once the wholly owned foreign subsidiaries and affiliates were a part of Socony proper. Now they are corporate arms of Mobil Overseas, in a decentralized operation.

Though the parent company kept control of its Middle East producing interests, Mobil Overseas acts as offtaker for Socony's crude interests in this area as well as others and, in addition, has certain production within its own affiliates. This means that Mobil Overseas handles about 400,000 bbl. of crude every day.

Shuffling that crude production, as well as the company's products, to meet supply needs after the Suez was closed, was one of the new president's problems.

Danner faced the problem of trying to make the crude and products go around but apportioning it equally among all established takers from Mobil Overseas.

"That's about all we could do, if we were going to handle the job fairly," he says. "It is working out pretty well, too."

This kind of an approach got him through 1956, all-in-all a pretty rough year in his field. But this year is going to bring more complex problems. The next 60 days will be the roughest in supplying Europe.

Danner's braced for the problems.

Personals

J. P. Johnson has been named drilling superintendent by Penrod Drilling Co., Shreveport, La.

Alfred W. Strange, with Union Oil Co. in Boling, Tex., has been transferred to the Abbeville, La., drilling and production staff.

Jack D. Montgomery, geologist with Cities Service Oil Co., has been assigned to the company's Midland, Tex., geological division.

James A. McAuley, engineer with Sun Oil Co. in Fremont, Tex., has joined Nortex Oil & Gas Corp. as drilling engineer in Dallas.

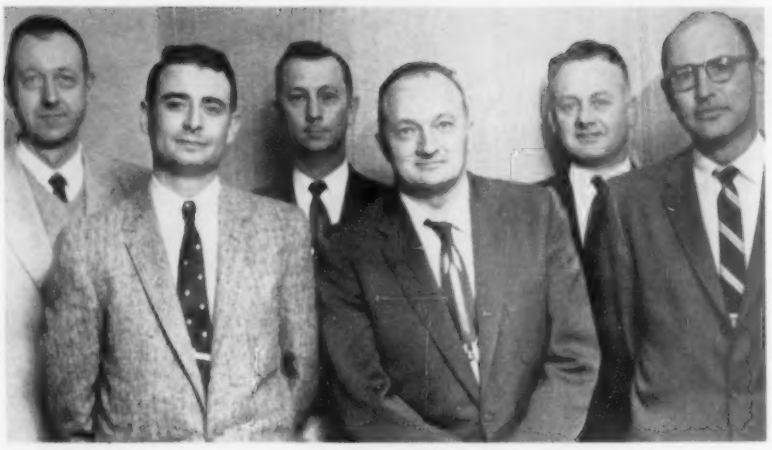
Gene C. Fiedorek, exploitation engineer with Shell Oil Co., has been transferred to Midland, Tex., from Hobbs, N. M.

F. B. Wallis has been named chief geophysicist for Texaco Exploration Co. in Calgary. A graduate of the University of Texas, Wallis has been with Texaco Exploration since 1948.

M. T. Stallter, Midland, Tex., independent, has been named president of the newly formed Texas-New Mexico Development Co. **Ross L. Shipley** is vice president for geology for the new firm. **O. H. Berry** is vice president for engineering and **Charles Phillips** is vice president and secretary-treasurer.

David W. Dolson, manager of crude-oil purchases and sales for Leonard Crude Oil Co., Mount Pleasant, Mich., has been appointed manager of crude oil and products supply for Leonard Refineries, Inc. Dolson was vice president of Mid-West Refineries, Inc., before joining Leonard Crude Oil Co. in 1956 soon after it was formed.

Morris Thompson, Jr., manager of the production department of Christie, Mitchell & Mitchell Co., and **B. F. Clark,** assistant to the president, have been elected vice presidents of the company. Thompson joined Christie, Mitchell & Mitchell in 1951 from a position as senior engineer with Shell Oil Co. Clark joined the company last year. He was formerly assistant to the executive vice president of Pan-Am Southern Corp. In other appointments **Sidney A. Parkans,** manager of Christie, Mitchell & Mitchell's geological department, has been appointed assistant to the executive vice president and **Leland Brooks,** manager of the land department, has been named assistant to the president.



Denver A.I.M.E. Petroleum Engineers Elect

Paul Grimm, The Texas Co., far right, has been elected 1957 president of Denver section, petroleum division of the American Institute of Mining, Metallurgical and Petroleum Engineers. Also heading up the group will be, left to right, John Ferry, E. A. Polumbus, Jr., & Associates, first vice chairman; Jim Edwards, McCullough Tool Co., second vice chairman; John Banister, Halliburton Oil Well Cementing Co., secretary-treasurer; Fred Poettmann, Ohio Oil Co., director; Marvin Owen, Central Bank, director; and Grimm.

Kent C. Nixon, geologist with Cities Service Oil Co., has been transferred to Tyler, Tex., from Olney, Ill.

H. Neil S. MacKenzie has joined New Chamberlain Petroleums, Ltd., as senior geologist.

Lee B. Thompson, Jr., trainee with Cities Service Oil Co., has been assigned to the company's crude-oil supply division, Bartlesville, Okla.

Dewey Bushaw has joined Carter Oil Co. in Minot, N. D., as a geologist. **Bill Haskins** and **George Bechner,** geophysicists with Carter in Minot, have been transferred to Miles City, Mont.

John A. Scrymgeour has been named executive vice president of Home Oil Co. Scrymgeour has been with Home Oil and allied companies since 1946. He formerly was with Imperial Oil, Ltd.

Reuel Casey, formerly on special assignment for Shell Oil Co. in Tulsa, has been named operations foreman at the company's Bryan 17 gas plant near Pampa, Tex. He succeeds **E. D. Bellmyer,** who has retired.

Clifford T. Nicholson, superintendent of refinery projects division at the Whiting, Ind., refinery of Standard Oil Co. (Ind.), has been appointed administrative assistant in the office of **Frank O. Prior,** president of Indiana Standard. **James E. Bryan** has been named supervisor of administrative reports and **James N. Roper,** formerly in the manufacturing department's planning division, will succeed Nicholson at Whiting.

A. L. Wempe, field engineer with Columbian Carbon Co. in Conroe, Tex., has been appointed plant supervisor for the company in Eola, La.

W. Earl Dunn has been named vice president and general manager of Blaw-Knox Co.'s chemical plants division in Pittsburgh.

J. Porter Langfitt, Pure Oil Co. executive vice president, has been named to manage the Red Cross drive for the Chicago area.

Bob Lawson, formerly engineer with Midstates Oil Corp. in Tulsa and Haynesville, La., has joined Oakland Corp. as district engineer in Seymour, Tex.

George B. Pichel, geologist with Union Oil Co. in New Orleans, has been named district geologist for offshore operations and transferred to Houston.

Dan Fitzgerald, formerly with Ohio Oil Co., has been named technologist for Petroleum Engineering Management Corp., Tulsa. Fitzgerald was active in Oklahoma and Kansas area production with Ohio Oil.

Dr. Gerhard Herzog has been appointed assistant general manager of The Texas Co.'s research and technical department. **B. D. Lee** has been named manager of exploration research and **K. C. ten Brink,** manager of production research. **J. C. Allen** will be director of production research and **A. S. McKay** director of exploration research.

Harold R. Prescott, Continental Oil Co.'s geophysical section manager of the exploration department, Houston,

H. R. PRESCOTT

B. G. SWAN

has been promoted to assistant manager of the foreign department, a new position. **B. G. Swan,** central region exploration manager for Conoco in Oklahoma City, will succeed Prescott in Houston as geophysical section manager. **B. B. Colley,** assistant manager of the geological section in Houston, has been transferred to Oklahoma City to replace Swan. Prescott has been with Continental since 1928. He was chief geophysicist before becoming assistant manager and then manager of the geophysical section. Swan joined Conoco in 1932 and Colley has been with the company since 1950. In other appointments, **H. D. Christner,** Oklahoma division engineer, has been appointed staff engineer of the region production office and **G. C. Sawvel,** senior production engineer in Houston, has been transferred to Oklahoma City as Oklahoma division engineer replacing Christner.

Levi Schrock, district drilling superintendent for Warren-Bradshaw Drilling Co. in Midland, Tex., has been transferred to Farmington, N. M., in the same capacity.

J. Mark Richardson and **Edwin P. Matthews,** geologists with Midstates Oil Corp., and **Jack W. Matson,** scout, have been transferred from Wichita to Oklahoma City. Richardson will be Kansas district geologist for the company.

R. Y. Pogontcheff, mechanical engineer for Shell Oil Co., has been promoted to division mechanical engineer and transferred to Edmonton from Hobbs, N. M.

Dr. Charles L. Thomas, director of research and development for Sun Oil Co., has been named a director of American Chemical Society. He succeeds **Dr. Clifford F. Rassweiler,** Johns-Manville Corp. vice president of research and development and president-elect of the society. As A.C.S. president, Rassweiler will be an ex-officio director. Thomas has been with Sun since 1951. He was formerly research director of Great Lakes Carbon Corp.

Wayne H. Kerr has been elected president of Sunnyland Contracting Co., Rayne, La. He succeeds the late J. E. Treadway. **Mrs. Blye R. Treadway** has been named vice president and **Daniel E. Leleux** will be general manager.

C. L. Parris, chief engineer at American Oil Co.'s El Dorado, Ark., refinery, has been named manager of Amoco Chemicals Corp.'s new petrochemical plant scheduled for the Midwest. Amoco has not yet announced a site for the plant.

C. B. Ames, vice president of Fish Engineering Corp., has been elected president. He succeeds **Ray C. Fish,** who has been named chairman of the board. Ames has been with Fish Engineering since its founding in 1946.

Billy Webb Dawkins, petroleum engineer for Union Producing Co. at New Orleans, has been promoted to field drilling and production superintendent and transferred to Houma, La. A graduate of Louisiana State University, Dawkins has been with Union since 1951. He was production engineer for Pan American Production Co. before joining Union.

Roy Mays, manager of exploration in the Rocky Mountain area for Continental Oil Co., has been appointed assistant regional general manager for the company in Fort Worth. **Charles B. Smith,** head of the Denver regional geophysical section, will replace Mays as Rocky Mountain exploration manager. **Howard C. Briggs** has been transferred from Los Angeles to Denver to become assistant to the regional general manager there.

H. W. Torgeson, staff assistant to **W. T. Cravens,** Cities Service Oil Co. vice president and manager of refinery operations, has been appointed manager of the company's Ponca City, Okla., refinery. He replaces **S. R. McMurry,** who has been transferred to Bartlesville, Okla., as special representative in the industrial relations division. Three assistant managers have also been appointed at the Ponca City refinery. **L. G. Brannin,** cracking foreman, has been named assistant plant manager in charge of operations. **C. W. Rohler,** chief process engineer at the refinery, has been appointed assistant manager in charge of technical services, and **H. R. Shepherd,** superintendent of labor relations, has been appointed assistant manager in charge of personnel. **M. E. Wooldridge,** formerly plant superintendent in Ponca City, has been transferred to Bartlesville as head of the refining division's operations department.

Personals

Samuel Plummer has been appointed petroleum engineer in Farmington, N. M., for U. S. Geological Survey.

Emerson K. Beekly, division geologist for the Murphy Corp. in Billings, Mont., has resigned to become a consultant there.

George J. Abraham, engineering trainee with Atlantic Refining Co., has been transferred to Lafayette, La., from Merryville, La.

Robert L. Sprague, formerly division exploitation engineer in Lake Charles, La., for Shell Oil Co., has been appointed exploitation engineer in New York.

Ted E. Waibel, Jr., junior petroleum engineer with Sinclair Oil & Gas Co., has been transferred to Nowata, Okla., from Lindsay, Okla.

E. W. McGoldrick, Kenneth M. McGoldrick, and **J. M. Watson** have formed McGoldrick & Watson Drilling Co. in Shreveport, La. The company will operate in Louisiana and Arkansas.

T. B. KIMBALL

Thomas B. Kimball, Sinclair Refining Co. vice president and director of manufacturing, and **Marc F. Braeckel,** vice president and director of marketing, have been elected executive vice presidents of the company. **James A. Ahearn,** vice president and director of transportation, supply, and distribution, has been named executive assistant to **James E. Dyer,** Sinclair Refining president.

J. H. Sullivan has joined the U. S. Army Corps of Engineers petroleum equipment branch at Fort Belvoir, Va., as project engineer. Sullivan was formerly with Ball Associates and was geological engineer with Mene Grande Oil Co. in Venezuela at one time.

S. R. Denton, senior petroleum engineer in Tulsa for Pan American Petroleum Corp., has been appointed central division unitization superintendent and transferred to Oklahoma City. **Bruce A. Landis, Jr.,** also senior petroleum engineer, has been transferred from Tulsa to Casper, Wyo., as Rocky Mountain division unitization superintendent.

Personals

Bob Faucette, geologist with Cities Service Oil Co., has been transferred to Albuquerque from Olney, Ill.

Roy Carmack and **Art Burki,** formerly with Inland Oil Corp., have resigned to open consulting offices in Oklahoma City.

Nelson M. Lytle, master mechanic for Interstate Oil Pipe Line Co., has been appointed assistant superintendent of the Sunset, La., district.

John Fraher has been appointed district petroleum engineer for U. S. Geological Survey. Great Falls, Wyo. He succeeds **William M. Peden,** who has retired.

Fred Mace, operations manager for Sahara Petroleum Co. in Egypt, has been transferred to Houston for assignment to Continental Oil Co.'s offshore operations. Mace was with Continental in Denver before joining Sahara.

Benjamin Miller, New York consultant, has joined H. Zinder & Associates, Inc., at the firm's new New York office. Miller has been a consultant since 1945. Before that time he was with Cities Service Co. working mainly with natural gas pipeline development.

E. T. Lincoln, general superintendent for Sinclair Oil & Refining Co., subsidiary of Venezuelan Petroleum Co., at Santa Barbara, Monagas, has been transferred to Caracas as executive assistant. **W. C. Summy,** production superintendent in the Santa Barbara district, has been appointed general superintendent in charge of all drilling and production. **Carmen R. Apt,** chief engineer in charge of the company's Santa Barbara district gas and gas products plant, will move up as assistant superintendent of the district. **H. I. Liechty,** Apt's assistant, will replace him as chief engineer.

William J. Lawless, acting superintendent of Pure Oil Co.'s light oil and cracking division at the company's Smiths Bluff refinery, Nederland, Tex., has been appointed division superintendent. Lawless, formerly assistant superintendent, has been acting superintendent since the death of R. C. McFarlane last year. **Francis J. Martin,** general operating foreman of the fluid catalytic cracking unit and catalytic reformer, has been named assistant superintendent of the division. **Lloyd W. Dussell,** formerly operating foreman, will replace Martin as general operating foreman.

J. B. Brooke, drilling superintendent with Travis Drillers, Inc., has been transferred to Abilene, Tex., from Luling, Tex.

Edward L. Ingram, reservoir testman for Atlantic Refining Co. in Odessa, Tex., has been named engineer's aide in Houston.

W. R. Anderson has been appointed gas engineer in the Four Corners area for General Petroleum Corp. He will be located in Durango, Colo.

Jack M. Decker, Bakersfield, Calif., consulting geologist, has joined Pacific Oil & Gas Development Corp. as manager of exploration and head of the company's new Bakersfield office. Decker was with General Petroleum Corp. before becoming a consultant.

L. C. Hooper and **J. C. Mosley** have joined the engineering division of Humble Oil & Refining Co.'s Baytown, Tex., refinery. **J. A. English, G. W. Griffin,** and **D. G. Walker** have joined the refinery's research and development division. New additions in technical service division are **G. W. Berner, D. A. Foster, D. E. Griffith, R. L. Presley, D. R. Riggs, R. M. Sharp,** and **J. D. Wheeler.**

S. H. Lloyd, formerly chief engineer with Salt Dome Production Co., has been appointed manager of Blue Water Drilling Corp. Lloyd had been working with offshore drilling operations for Salt Dome Production since 1947. He is a graduate of Missouri School of Mines.

James N. Bowerman, production geologist with Humble Oil & Refining Co. in Pleasanton, Tex., has joined the New York State Geological Survey as geologist in Wellsville, N. Y.

C. M. Hartwell, marine superintendent for Cities Service Oil Co. in Houston, has been named district superintendent of production operations in Mississippi and Louisiana. He succeeds **M. A. Reber,** who has been appointed operations manager of Dhofar-Cities Service Petroleum Corp., exploration subsidiary operating in Dhofar. Hartwell has been with Cities Service since 1947. He was district superintendent at Hobbs, N. M., before going to Houston.

DEATHS

Stanley A. Thompson, 71, president of Westbrook-Thompson Holding Corp., secretary-treasurer of Westbrook Oil Corp. and one-time president of the Fort Worth Cats baseball club, died February 19 in Fort Worth. Thompson, with two others, drilled the discovery well in Winkler County, Texas, in the mid-1920's. He owned oil properties throughout Texas independent of his two firms.

William Campbell Lehman, 71, Olympia, Wash., petroleum geologist, died recently in Olympia. A pioneer driller in the Southwest, Lehman's most recent developments were in the Olympic peninsula area.

M. E. Wyze, assistant drilling superintendent for Anschutz Drilling Co., Billings, Mont., was killed recently when the company plane he was piloting crashed during a snowstorm while he was on a routine tour of Montana drilling sites.

Arthur R. Perkins, 81, Montana oil man of the 1920's and 30's, died recently in Wauconda, Wash. Perkins drilled the first well in Montana's Hill County field and was active in the Kevin-Sunburst, Pondera, and Bowdoin fields.

Fred W. Anderson, 42, engineer for Russell Engineering Corp., Houston, was killed February 13 in a truck accident in northwestern Colorado. Anderson moved to Fort Morgan, Colo., early in February to supervise construction of a natural-gas plant in Leader field.

Lloyd Snyder, 71, retired district superintendent for the old Mid-Continent Petroleum Corp., died February 17 in Arkansas City, Kans. Snyder was superintendent for the company in Wichita before his retirement in 1950.

Eugene V. Hilliard, 51, of E. V. Hilliard Drilling Co., Mount Pleasant, Mich., died February 11 after a long illness. Hilliard discovered Headquarters Traverse oil pool in Roscommon County, Michigan, in 1941.

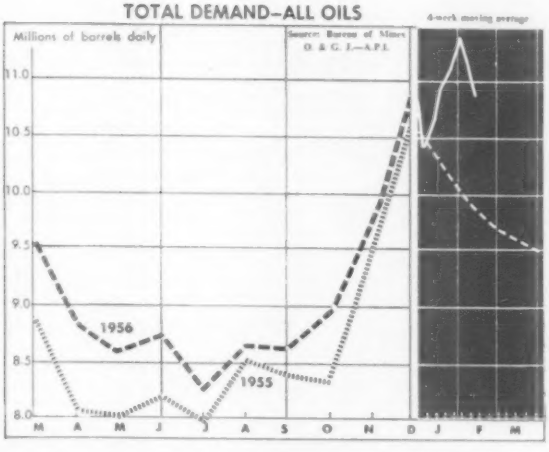
Sam E. Wilson, Jr., 57, Corpus Christi independent operator, died February 17 in New Orleans after a heart attack. Wilson had been particularly active in South Texas oil developments.

G. L. Whipple, chief geologist for Standard Oil Co. of Texas, died February 19 in Houston after a heart attack.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,517,375	UP	63,100	UP	310,073
Crude stocks	250,927,000	DOWN	3,064,000	DOWN	2,557,000
Completions	981	DOWN	164	DOWN	47
Refinery runs	7,976,000	DOWN	143,000	UP	187,000
Gasoline stocks	202,254,000	UP	2,359,000	UP	12,826,000
Kerosine stocks	22,552,000	DOWN	1,062,000	UP	3,011,000
Distillate stocks	91,385,000	DOWN	2,131,000	UP	13,535,000
Residual stocks	35,812,000	DOWN	1,230,000	DOWN	2,391,000
Four-product stocks	352,003,000	DOWN	2,064,000	UP	26,981,000
Total imports	1,469,000	DOWN	43,300	UP	38,400



Softening Inland Distillate Markets Call for End-of-Season Planning

SOMETIME between the middle of February and the first of March suppliers and jobbers take a long look at distillate-stock figures, their own and industry totals. The result often is a softening of heating-oil markets.

The jobber knows that any cold spell after the middle of February will be short, probably not more than a few days. This means that he doesn't have to keep his tanks as full as he did earlier in the winter. If a check of his supply terminal shows plenty of distillate on hand, he knows that he can replenish his own stocks on short notice.

There is a money angle also. Since there is always a possibility that distillate prices will ease off near the end of the heating season, the jobber reduces his stocks so that his loss in inventory value will be low if prices drop. His action tends to increase the chance of a price reduction. This reduction of secondary stocks at a time when the home owner is deciding that maybe he has enough fuel for the remainder of the season cuts the movement out of primary storage.

At the same time, the primary supplier is planning inventory adjustments to cut distillate stocks down to a good working level by the end of the heating season. He may decide that he must sell a few thousand barrels extra over the next month.

This combination of a few suppliers needing to sell some light fuel and jobbers cutting down on purchases fulfills the requirements for a soft market.

But, these adjustments may be even more troublesome if held over until the second quarter. There is a tendency for suppliers to base market plans on last year. This is dangerous unless last year was normal, and the second quarter of 1956 was far from normal. Domestic demand for distillate fuels in April and May topped sales in the same months of 1955 by 23.5 per cent, all because the heating season lasted much longer than normal.

On the other side, middle-distillate stocks are not as high as a direct comparison with last year indicates. Stocks were low last year, and unless that fact is considered, the surplus of about 13 million barrels over last year seems excessive. Stocks at the end of February last year were about the same as in 1954. Thus, current stocks are about 13 million barrels higher than in 1954.

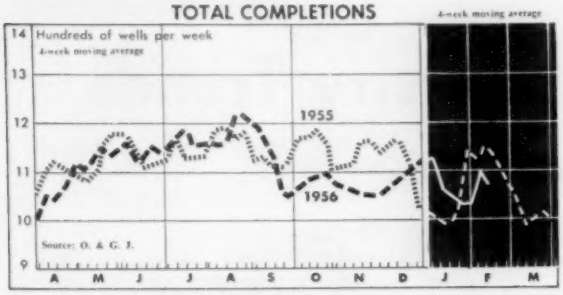
The primary supplier who considers the whole picture may decide that he can control distillate stocks this spring through reduced refinery runs rather than product dumping. These decisions will have to be made in a hurry, because the Group 3 distillate market is softening a little.

Formal Group 3 postings remain the same, but under-the-low sales have increased enough to show an actual spot-market loss of at least 0.125 cent a gallon over the past week.

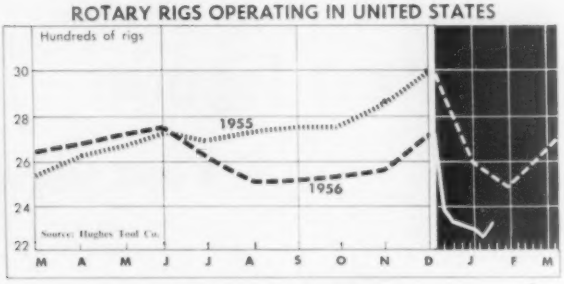
In general, the softening is confined to inland areas. Demand on the Gulf Coast will continue strong for some time because of European demand. Refinery operations in Europe will not be back to normal until a month or more after the Suez Canal is opened and crude lines from Iraq are operating.

However, the resumption of normal movement of Middle East crude to Europe will take some of the edge off the sharp demand for distillate. High freight rates will tend to cut the movement of Mid-Continent distillate to the Gulf Coast for export. Demand on the Gulf Coast will be good but the need will not be critical.

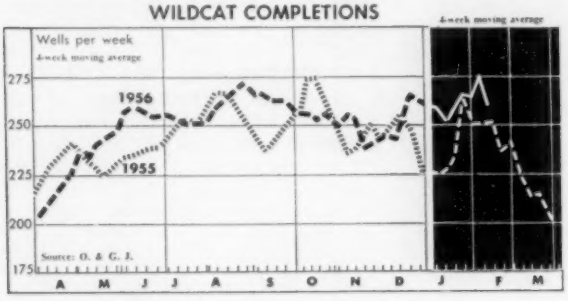
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	2-18-57	2-11-57	2-20-56
North Central and East	49	53	71
Southeast	23	26	34
Okla., Kans., Ark., Mo.	410	373	491
Louisiana	451	451	413
North and East Texas-Panhandle	396	346	416
Gulf and South Texas	228	212	284
West Texas-New Mexico	490	492	494
Rocky Mountain	188	191	208
Pacific Coast	101	106	123
Total United States	2,336	2,250	2,534
Western Canada	240	244	231

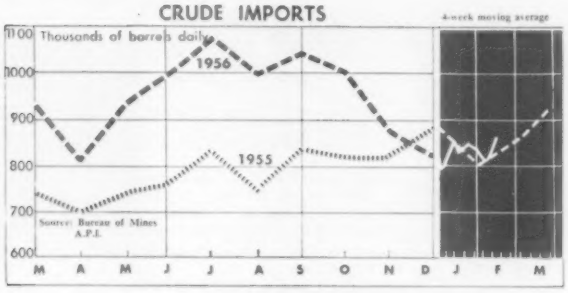
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 16, 1957

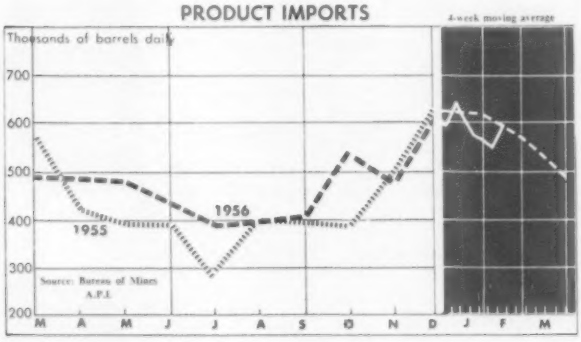
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1957				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	0	0	0	0	0	4	16	0	0	0	0	0	0	0	0	3	3
Arkansas	11	6	0	5	28,150	155	96	0	0	0	3	3	3	0	0	20	23
California	30	18	0	12	150,292	281	266	0	0	0	11	11	4	0	2	72	78
Colorado	16	3	1	2	77,460	162	161	0	0	0	10	10	5	0	1	104	110
Illinois	44	15	1	28	98,409	336	546	0	0	0	9	9	3	0	0	79	82
Indiana	14	4	0	10	20,662	96	97	0	0	0	5	5	3	0	0	14	17
Kansas	105	52	11	*42	378,479	583	640	5	0	0	10	15	18	0	3	86	107
Kentucky	24	7	2	15	43,561	210	257	0	0	0	7	7	7	0	1	38	46
Louisiana	66	45	7	14	491,872	506	571	0	0	1	4	5	12	4	14	57	87
North	25	19	1	5	111,834	215	224	0	0	0	1	1	2	0	1	20	23
South	28	17	5	6	272,468	216	283	0	0	1	2	3	6	4	12	33	55
Offshore	13	9	1	3	107,570	75	64	0	0	0	1	1	4	0	1	4	9
Michigan	10	5	0	5	31,375	52	72	2	0	0	4	6	3	0	0	21	24
Mississippi	10	4	0	6	78,551	39	64	1	0	0	4	5	3	0	0	15	18
Montana	1	0	0	1	10,445	44	58	0	0	0	1	1	1	0	0	16	17
Nebraska	12	3	0	9	71,099	103	121	0	0	0	7	7	5	0	0	56	61
New Mexico	31	19	6	6	131,843	268	282	1	0	1	5	7	10	0	4	31	45
Northwest	10	2	6	2	40,964	99	96	0	0	1	1	2	4	0	3	9	16
Southeast	21	17	0	4	90,879	169	186	1	0	0	4	5	6	0	1	22	29
North Dakota	12	5	0	7	82,865	44	28	1	0	0	5	6	3	0	0	14	17
Ohio	23	15	2	*6	61,782	131	149	0	0	0	0	0	0	0	0	2	2
Oklahoma	114	84	3	†27	370,864	942	1,236	4	0	0	8	12	19	3	0	89	111
Pennsylvania-New York	2	0	2	0	10,732	41	79	0	0	1	0	1	0	0	3	11	14
Texas	434	260	22	152	1,890,130	3,082	2,888	15	0	8	101	124	109	4	36	762	911
Southwest (1 & 4)	43	20	8	15	177,273	353	414	5	0	2	12	19	15	2	13	119	149
Gulf Coast (2 & 3)	67	25	10	32	430,316	371	382	2	0	5	15	22	11	0	19	105	135
East (5 & 6)	26	13	1	12	118,926	191	171	0	0	0	7	7	3	0	0	53	56
N. Central (7-B & 9)	159	83	0	76	413,391	1,139	991	4	0	0	55	59	52	0	2	353	407
West (7-C & 8)	120	104	1	15	674,575	822	764	4	0	1	11	16	26	0	2	114	142
Panhandle (10)	19	15	2	2	75,649	206	166	0	0	0	1	1	2	2	0	18	22
Utah	0	0	0	0	0	18	11	0	0	0	0	0	3	0	0	8	11
West Virginia	11	2	7	2	31,105	98	91	0	0	1	0	1	0	0	6	2	8
Wyoming	11	4	0	7	46,602	115	111	0	0	0	3	3	6	0	0	35	41
Miscellaneous	0	0	0	0	0	12	29	0	0	0	0	0	0	0	1	5	6
Total U. S.	**981**	551	64	366	4,106,278	7,322	7,869	29	0	12	197	**238**	217	11	71	1,540	1,839
Total previous week	1,150	662	77	411	4,689,627			32	1	9	228	270	188	11	59	1,343	1,601
Total Feb. 18, 1956	1,028	557	54	417	4,225,869			31	2	5	204	242	236	27	52	1,489	1,803
Cumulative 1957	7,322	3,904	513	2,905	30,147,635												
Western Canada	53	31	4	18	222,233	288		1	0	3	14	18	5	0	6	57	68

Service wells included: *2, †1.

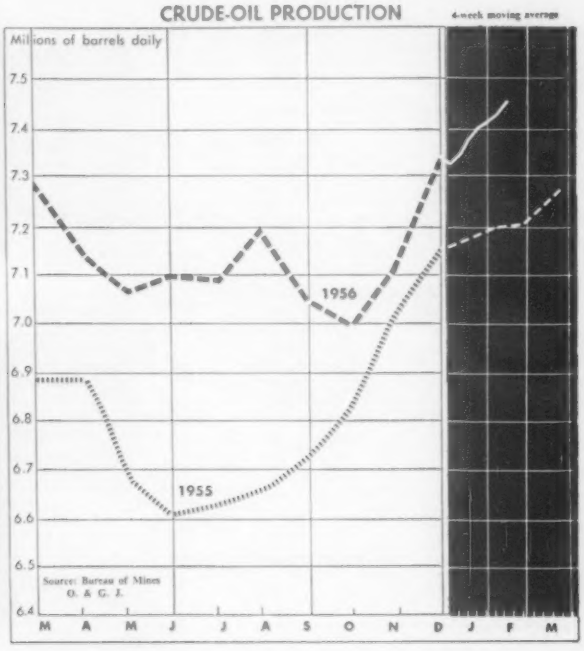
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

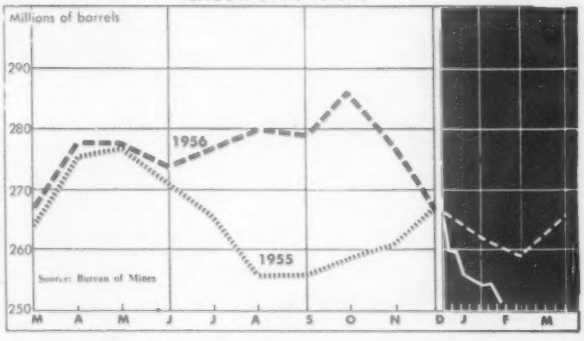


DAILY AVERAGE PRODUCTION FOR WEEK

	February 16, 1957			Feb. 9
	Crude oil	Lease condensate	Total	total
Alabama	11,350		11,350	11,300
Arkansas	80,650	450	81,100	80,950
California	938,300		938,300	939,400
Colorado	161,200		161,200	160,250
Eastern	50,100		50,100	49,900
Florida	1,250		1,250	1,250
Illinois	230,400		230,400	232,300
Indiana	32,000		32,000	32,000
Kansas	†358,750		†358,750	†343,250
Kentucky	50,700		50,700	48,900
Louisiana	897,500	77,900	975,400	975,000
North	126,500	2,900	129,400	129,000
South	771,000	75,000	846,000	846,000
Michigan	26,500		26,500	26,700
Mississippi	107,550	5,200	112,750	112,750
Montana	69,250		69,250	69,850
Nebraska	37,850		37,850	38,650
Nevada	100		100	100
New Mexico	253,300	4,975	258,275	258,275
North Dakota	43,450		43,450	40,200
Oklahoma	†640,400		†640,400	†591,000
Texas	3,074,000	56,350	3,130,350	3,130,350
Dist. 1	56,000	525	56,525	56,525
Dist. 2	152,000	8,950	160,950	160,950
Dist. 3	432,000	26,500	458,500	458,500
Dist. 4	238,000	6,500	244,500	244,500
Dist. 5	42,000	500	42,500	42,500
Dist. 6	138,000	6,350	144,350	144,350
East Texas Field	214,000		214,000	214,000
Dist. 7-B	165,000	100	165,100	165,100
Dist. 7-C	171,000	4,400	175,400	175,400
Dist. 8	1,156,000	1,425	1,157,425	1,157,425
Dist. 9	212,000	825	212,825	212,825
Dist. 10	98,000	275	98,275	98,275
Utah	12,300		12,300	11,700
Wyoming	295,500		295,500	300,100
Others	‡100		‡100	‡100
Total U. S.	7,372,500	144,875	**7,517,375**	7,454,275
Change from prev. week, up			**63,100**	
Canada	†565,100		†565,100	†486,300
Total U. S. production, January 1-February 16				349,350,500 bbl.
Same period last year (plus cond.)				*337,794,430 bbl.

*Includes 5,961,690 bbl. condensate. †Week ending previous Monday. ‡S. Dakota.

CRUDE-OIL STOCKS

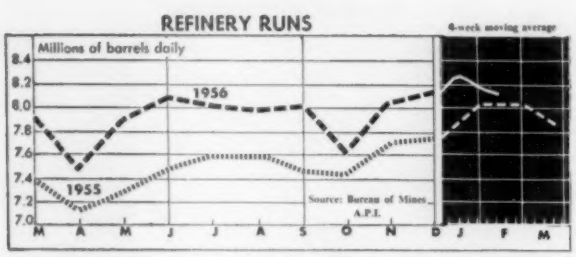


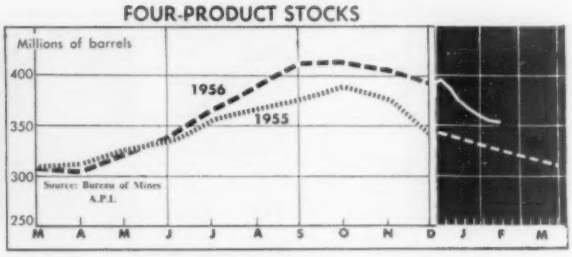
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

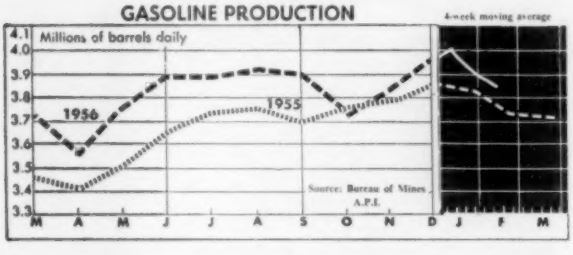
(Thousands of barrels)

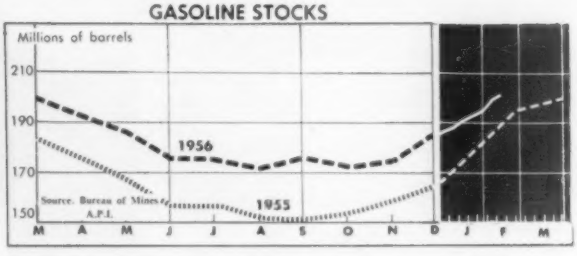
	2-9-57	2-2-57	2-11-56
Pennsylvania Grade	2,360	2,362	2,651
Other Appalachian	2,076	2,258	1,942
Illinois, Indiana, Michigan	10,260	10,123	9,358
Nebraska, North Dakota	2,112	2,186	2,017
Kansas	9,446	9,677	7,718
Oklahoma	21,179	21,428	21,582
Arkansas	2,926	2,915	2,209
Louisiana	19,229	18,777	15,960
North	2,910	2,849	2,623
South	16,319	15,928	13,337
Mississippi	2,707	2,688	2,943
New Mexico	7,575	7,954	7,269
Texas	109,399	111,966	121,521
East Texas proper	8,279	9,235	8,981
West Texas	51,672	52,701	59,676
Texas Gulf	20,714	21,575	22,437
Other Texas	28,734	28,455	30,427
Wyoming	15,722	16,261	15,231
Other Rocky Mountain	6,124	5,983	5,179
California	27,314	27,484	27,531
Foreign	†12,498	11,929	10,373
Total	250,927	253,991	253,484

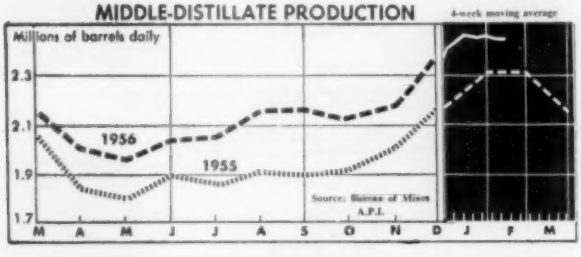
*Bureau of Mines. †Includes 2,786,000 bbl. in California.

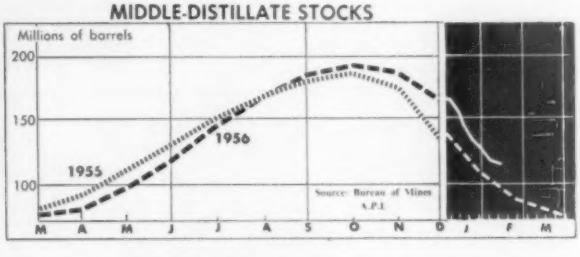


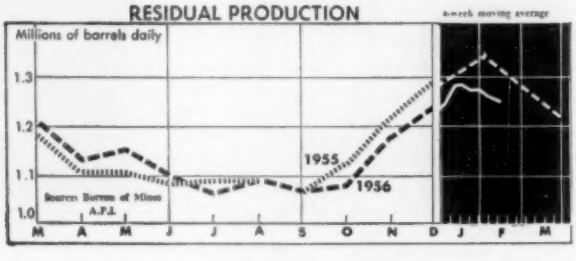


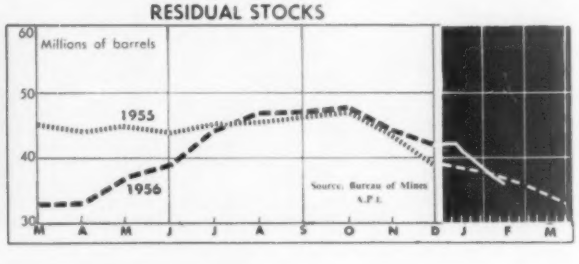

GASOLINE PRODUCTION
Millions of barrels daily
4-week moving average
1956
1955
Source: Bureau of Mines A.P.I.
M A M J J A S O N D J F M




MIDDLE-DISTILLATE PRODUCTION
Millions of barrels daily
4-week moving average
1956
1955
Source: Bureau of Mines A.P.I.
M A M J J A S O N D J F M




RESIDUAL PRODUCTION
Millions of barrels daily
4-week moving average
1955
1956
Source: Bureau of Mines A.P.I.
M A M J J A S O N D J F M



A.P.I. REFINERY REPORT, FEBRUARY 15, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1956: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,180	487.9	41.7	368.8	202.7	41,549	9,950	32,115	8,578	1,116	463.4	42.3	304.3	239.6
Appalachian:														
District 1	98	33.9	5.3	26.1	6.9	5,016	475	2,288	359	99	39.7	4.8	25.6	9.3
District 2	110	62.1	7.6	21.3	16.4	3,032	383	788	311	107	52.5	7.0	21.2	15.1
Ind., Ill., Ky.	1,442	720.0	72.7	358.4	208.7	36,671	4,134	13,613	4,511	1,423	710.5	78.5	302.8	199.2
Minn., Wis., Dak.	99	48.7	9.1	23.6	7.9	7,043	729	4,832	254	92	43.4	11.9	17.0	9.2
Okla., Kans., Mo.	672	397.0	26.9	169.0	53.9	19,904	894	9,079	1,055	715	399.4	15.8	188.3	41.4
Inland Texas	275	204.1	8.4	65.9	20.0	8,728	355	1,514	1,790	275	182.7	9.7	50.5	28.3
Texas Gulf Coast	1,875	863.0	116.2	590.1	240.9	28,995	2,665	8,524	5,324	2,025	888.9	138.9	553.1	258.4
La. Gulf Coast	687	303.4	66.7	191.3	55.1	12,485	1,512	4,355	1,650	692	325.0	55.2	204.8	63.5
N. La. and Ark.	103	31.7	9.9	23.6	7.0	5,347	800	2,018	201	95	36.4	9.3	20.6	5.8
Rocky Mountain:														
New Mexico	26	12.6	0.4	4.3	3.0	478	11	94	61	21	11.8	0.4	3.2	3.1
Other Rocky Mtn.	293	138.7	3.4	65.9	43.4	7,313	298	2,366	949	278	130.1	4.2	66.0	44.2
California	1,116	457.9	4.6	189.6	374.4	25,693	346	9,799	10,769	1,109	461.5	7.0	160.6	368.8
Feb. 15, 1957	7,976	3,761.0	372.9	2,097.9	1,240.3	202,254	22,552	91,385	35,812	8,047	3,745.3	385.0	1,918.0	1,285.9
Feb. 8, 1957	8,119	3,912.3	373.3	2,012.3	1,270.6	199,895	23,614	93,516	37,042	.....	.....	.....	.....	.....
Feb. 17, 1956	7,789	3,699.8	389.0	1,961.4	1,279.0	189,428	19,541	77,850	38,203	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

Regular (88 octane)	12.00-12.25
Premium (96 octane)	13.75-14.00

Gulf Coast (cargoes for coastwise or export movements):

Regular (90 octane)	11.25-11.50
Regular (92 octane)	11.50-11.75
Premium (97 octane)	13.25-13.50
Premium (98 octane)	13.50-14.00

California (rack):

Regular (84 octane)	13.1
Premium (93 octane)	14.1
Premium (96 octane)	15.1

Caribbean area (cargoes):

Regular (87 octane)	11.00
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	5.0

Breckenridge:

Grade 26-70	4.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

★ Kerosine 42-44	10.50-10.75
★ Diesel oil (58 d.i. and above)	10.125-10.375
★ Distillate No. 1	10.125-10.375
★ Distillate No. 2	9.50-9.75

Gulf Coast (cargoes):

★ Kerosine 41-43	10.75-11.00
★ Distillate No. 2	10.25-10.50

New York Harbor (barges):

Kerosine 41-43	12.25
Distillate No. 2	11.65
Diesel fuel, 48-52 d.i.	11.95

Caribbean area (cargoes):

Distillate No. 2	10.25

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank cars	6.50

New York (export):

126-130 A.m.p. crude scale (solid in bags or barrels	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$2.40-2.50
Gulf Coast (cargoes):	
★ Bunker C fuel	$2.75-3.00
New York Harbor (barges):	
Bunker C fuel	$3.30-3.40
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.75-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67				
15-15.9	2.71				$1.89
16-16.9	2.74				1.94
17-17.9	2.78				1.99
18-18.9	2.82				2.04
19-19.9	2.85				2.09
20-20.9	2.89	$2.75		$2.62	2.14
21-21.9	2.93	2.77		2.64	2.19
22-22.9	2.97	2.79		2.66	2.24
23-23.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95		2.82	2.63
31-31.9	3.38	2.97		2.84	2.67
32-32.9	3.44	2.99		2.86	2.71
33-33.9	3.50	3.01		2.88	2.75
34-34.9	3.56	3.03		2.90	2.79
35-35.9	3.61	3.05		2.92	2.83
36-36.9	3.65	3.07		2.94	2.87
37-37.9	3.68	3.09		2.96	2.89
38-38.9		3.11		2.98	2.91
39-39.9		3.13		3.00	2.93
40 and up		3.15		3.02	2.95

*Includes Oklahoma, most of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low Cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, Jenuary 3-January 10, 1957; Pennsylvania Grade, January 16, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.88
Middle District	4.70
Southwest Pennsylvania	4.41
West Virginia	4.23
Buckeye Grade	4.23
Zanesville Grade	3.27
Illinois Basin	3.15
Canada:	
Leduc-Woodbend (flat prices D-2), D-3)	2.78
Redwater (Alta.) D-3	2.67
Smiley-Viking (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 40°-40.9°, Puerto La Cruz	3.37
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

Gulf-U.S.N.H., clean (USMC+175%)	$7.84
Gulf-U.S.N.H., dirty (USMC +167.5%)	7.62
★ N.W.I.-U.S.N.H., dirty (USMC +200%)	8.10
★ N.W.I.-U.K., dirty (Scale+295%) (128s. 5d.)	17.97
★ P.G.-U.K., dirty (Scale+340%) (350s. 2d.)	48.99

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FOR SALE—One 6⅝" to 13" OD full Landis pipe threading machine. Contact Otto Bendorf, Oil Field Salvage Company, Breckenridge, Texas.

1955 MODEL 1000 Mayhew Combination Air and Water Drilling Rigs. Also 315 cfm Schramm Diesel Air Compressors. V. M. Shortes, Box 127, Lovington, New Mexico. Phones 6-7591 or 8533.

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2—55,000 BBL. all steel storage tanks, 5 ring, sheets 6' x 20'6" long, complete in every detail, cleaned & ready to dismantle. Will reerect any place in U. S. or cut down and load on cars. Tonkawa, Okla. Atlas Tank & Steel, Inc. Phone 950.

FOR SALE: One Cardwell Single Drum Hoist, Model KS, Code Work—KSWW; complete with spudding attachment, D-8800 Caterpillar Diesel Power Unit, and mounted on 4-wheel trailer. Total operating time 2696 hours. Condition excellent. Price $4500. Michigan Chemical Corp., St. Louis, Michigan.

FOR SALE

143 Jts. 21.90± Grade D Youngstown API IUE R-2 Seamless Drill Pipe (New), complete with 143 7" OD x 4" ID Hughes API Full Hole Counter Bore Welded Tool Joints.

120 Joints 21.90± Grade D National Tube—Same description as above, also new.

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FORMER LACY REFINERY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
1—5' x 96' tower, 40 tray, 135# WP
1—2' x 50' tower, 24 trays.
1—Ethyl lead plant
2—Upshot heaters, 10 mil. BTU/hr.
8—Welded storage tanks, 5,000, 2,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.

IN STOCK

VESSELS

2—12' x 45' Butane Tanks, 125#
2—12' x 45' Storage Tanks, 25#
1—14' x 21' Clay Tower, 125#
1—8' x 75' Tower, 20 Trays, 25#
1—18" x 32' Tower, 15 Trays, 160#
2—8½' x 25' Tanks 50#

HOT-OIL PUMPS

3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' Hd.
BJ hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

HEAT EXCHANGERS

3—Kellogg Adm. Fltg. Hd. 2200, 1800 Sq. Ft., 315#
4—Kellogg Stel Fltg. Hed. 800, 650, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome.
6—Adm. 785, 742, 425 Sq. Ft.
30—304 SS shell & tube condensers 100-1000 Sq. Ft.

COMPRESSORS

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GRADUATE MECHANICAL ENGINEER: Age 32, 6 years experience production, workover, water and gas injection. Desire responsible position Ark-La-Tex area. Box J-951, The Oil and Gas Journal, Tulsa, Oklahoma.

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P. O. Box 12103 Preston Station, Dallas, Texas.

OKLAHOMA

SOUTHEAST OKLAHOMA

Old Workover in Sequoyah Flows Atokan Gas

A reworked deep try in shallow Northeast Redland gas field, Sequoyah County, is an Atoka gas discovery. Stephens Production Co. 2 Brant, NW NW NE 24-10n-25e, flowed 3,000 M.c.f. of gas per day from the basal Atoka-Pennsylvanian at 5,972-6,004 ft. and 6,017-38 ft. Production in this area is found at 1,800 ft.

The same operator will drill 1 Hale in SE SW NW 27-10n-25e to 6,100 ft.

WESTERN OKLAHOMA

Northwest Okeene Adds Its Second Producer

The second gas well to new Northwest Okeene field in Blaine County flowed 1,658 M.c.f. of gas per day on a 2½-hour test of perforations from 7,444 to 7,689 ft. in the Chester-Mississippian. The well is Perkins Brothers Production Co. 1 Robinson, C SW NE 9-19n-11w, ¾ mile northwest of the discovery well of this new field.

Blaine County's only producing area, Northwest Okeene field, was opened late last year. Perkins has another well under way at 1 Brickman in C SW NE 15-19n-11w. Drilling is below 5,300 ft.

Grand Valley Pool Extended in Beaver

The northeast side of Grand Valley field, a Texas-Beaver County producing area, was extended at Gulf Oil Corp. 1 Trimmel, SW SW NE 18-2n-20eCM. The well flowed open 90,000 M.c.f. of gas per day after fracture in the Morrow sand at 6,626-60 ft.

NORTHWESTERN OKLAHOMA

Hunton Is New Pay Prospect at Woodward

Woodward County's sole producing area, Southeast Woodward field, may have a new producing zone in addition to its Morrow sand production. The Hunton lime is an indicated new pay at Union Oil Co. of California 1 Sherman, SE SE NW 13-22n-20w. The operator drill-stem-tested the Hunton at 10,287-10,312 ft. Gas flowed at the estimated rate of 100 M.c.f. per day. Recovery was 5 bbl. of distillate. Flowing pressure ranged from 690-735 psi.; bottom hole shut in was 3,716 psi. in 30 minutes.

The field has two Morrow gas-condensate wells, and was one of the exploratory highlights of 1956 in the Mid-Continent province. Union didn't find the Morrow sand reservoir at 1 Sherman and elected to continue drilling. There is no Hunton (Siluro-Devonian) production anywhere in western or northwestern Oklahoma.

CANADA

ALBERTA

New Pay Tapped In Joffre Field

Imperial Oil, Ltd., who has played a major part in the development of Joffre oil field, has discovered oil in a new zone in that field area. This pool, which was discovered in 1953 by the team of Canadian Superior Oil of California, Great Plains Development Co. of Canada, Ltd., and Bailey Selburn Oil & Gas, Ltd., produces oil from the Viking sand with an average pay thickness of 12 ft. being found at each well. It stretches in a northwest-southeast direction for 18 miles and the new strike is 4½ miles from the northwestern tip and is 4 miles north-northeast of the central Alberta city of Red Deer. The zone in which the new oil discovery was made has not been clearly defined as the drill-stem test that gave up the crude recovery straddled the lower portion of the basal Quartz formation and the top part of the Banff horizon. However, Imperial Oil officials are quite confident that the basal Quartz is the discovery zone but intend to carry out further tests in order to fully determine that factor.

This well, Imperial 7-7 Red Deer, on LSD 7, 7-39-26w4, during the discovery drill-stem test, flowed gas to surface at rate of 150,000 cu. ft. daily and when pipe was pulled there was 180 ft. of mud, 2,500 ft. of gassy oil and 900 ft. of salt water present in the drill-stem. Drilling operations are continuing at the well, which is scheduled as a Devonian test, after which further tests will be carried out on the oil showing.

Beddington Cardium Well Flowing 30 BOPD

Western Leaseholds, Ltd., operator of the 8-34 Beddington, Cardium sand oil discovery well that lies in southern area of Alberta, 4 miles north of Calgary's city limits, reported results of production tests run at that strike during the past number of days. The operator reported that the well is presently flowing 36°-gravity crude at a rate of approximately 30 bbl. per day. However, the well is producing that amount during a short period of possibly 3 to 4 hours after which there is a pressure drop-off. The well is then shut in and pressure will build up and then flow again. The company is preparing to run further productivity index tests on the well to determine at what rate the well can be produced.

The 8-34 Beddington, lies on LSD 8, 34-25-1w5, and was carried to total depth 9,172 ft. and after a series of production tests, which indicated gas flows up to 1,250 M.c.f. daily, were carried out in the D1 zone of Devonian, Western Leaseholds decided to test for oil production in the Cardium sand. Consequently the lower zone was plugged off and a 10-ft. interval below 5,910 ft. was perforated and fractured. After a series of swabbing operations were carried out the well commenced to flow and the present rate was established.

Successful Wildcats

ALBERTA

B.A. et al 10-12 Sibbald, LSD 10, 12-30-1w4. TD 2,896 ft. Banff gas well.

Provo-Naco 6-27 Hughenden, LSD 6, 27-40-7w4. TD 2,985 ft. Basal quartz gas well.

Fina-Stanolind-H.B. 15-25 Silver Creek, LSD 15, 25-60-16w5. TD 8,600 ft. D3 gas well.

SASKATCHEWAN

White Rose 16-25 Weyburn, LSD 16, 25-6-14w2. TD 4,630 ft. Charles oil well.

COLORADO

Washington County: F. C. Claycomb 2 Cartwright, C SW NW 25-3n-53w. IPF 2,500 M.c.f. of gas per day "D" sand discovery, new field. TD 4,961 ft. "J" sand.

SOUTH LOUISIANA

St. Charles Parish: Lone Star Producing Co. 1 Zimmer, 42-13s-20e. Shut-in gas well, no gage (flow on drill-stem test estimated 2,600 M.c.f. daily with spray of condensate through adjustable choke), perforations 10,656-63 ft. TD 11,250 ft. (New field.)

TEXAS GULF COAST

Bee County: Appell Drilling Co. et al 1 Burke, Anna Burke Sur., A-5 (1½ miles southeast of Beeville). IP 5,000 M.c.f. daily, open-flow potential, dry gas, perforations 3,124-31 ft. TD 3,136 ft. (New field.)

NORTH TEXAS

Knox County: Schulz & Brannan Drilling Co. 2 Lowrance, 74-2-D&W, 1 mi. N Munday, IPP 49 BOPD, 36°, GOR 200, Tannehill sand 2,008-23 ft. TD 2,021 ft.

Wise County: Christie, Mitchell & Mitchell 5 Gadberry, Thos. Denson Sur., A-239, 2 mi. E Boonsville. IP 956,000 cu. ft. of gas, 16/64-in., Strawn 3,424 ft. TD 3,500 ft.

Southern Union Gas Co. 1 Pearson, Sec. 43, MEP&P Sur., A-603, 1 mi. S Cottondale. Old well recompleted as gas discovery. TD 5,980 ft., conglomerate perforations 5,710-26 ft., IP 8,075 M.c.f. gas, open flow. Shut-in pressure 1,805 psi.

Young County: Big D Oil Co. 1 Harty, C. P. Benson Sur., A-1569, 1½ mi. SE South Bend. IP 98 BOPD, 20/64-in., TP 60

psi., GOR 950, Marble Falls 3,929-35 ft. TD 4,363 ft.

WEST CENTRAL TEXAS

Jones County: Fletcher Oil & Gas Drilling Corp. 1 Brockett, G. W. Penny Sur. 20, 9 mi. SW Anson. IP 491 BOPD, 20/64-in., TP 640 psi., GOR 770, 43°, Lower Cisco 3,756-66 ft. TD 3,953 ft.

WEST TEXAS

Garza County: Paul C. Teas 1 J. B. Slaughter "A," 31-1-J. Hays Sur., 6 mi. S Post. IP 266 BOPD, 1-in., TP 480-55 psi., GOR 530, 35°, Strawn 8,364-92 ft. TD 8,500 ft.

Sutton County: El Paso Natural Gas Co. 1 Mayer, 15-D-GC&SF, 11 mi. W Sonora. IP 1,175 M.c.f. gas, calculated open flow, Canyon sand 6,470 ft. TD 8,525 ft.

SOUTHWEST TEXAS

Atascosa County: Robert Mosbacher and W. T. Mendell 1 Butts & Sawyer, J. Poitevent Sur., A-710 (8 miles east of Jourdanton). IP 392.52 BOPD, $\frac{3}{4}$-in., 27°, perforations 7,422-29 ft. and 7,441-57 ft. (Anacacho). TD 8,193 ft. in Edwards. (New pay in South Pleasanton area—first Anacacho production in county and listed as new-field discovery.)

Bexar County: F. C. Gaines 1 Livingston, D. Martinez Sur. 1 (1½ miles north of Loseya). IP 403 BOPD, 5/16-in., open hole 1,855-86 ft. (Austin chalk). TD 1,886 ft. (New field.)

Gonzales County: George Coates 1 Tenberg, William Newman Sur., A-362 (11 miles northeast of Smiley). IP 20.43 BOPD, 7/64-in., 20.8°, GOR 220 cu. ft. per bbl., perforations 3,370-72½ ft. (Edwards). TD 3,375 ft. (New field—William Newman.)

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Billings, Montana. Notice is hereby given that approximately 201.19 acres of land in five parcels within the known geologic structure of CUT BANK field, Montana, and approximately 3083.74 acres of land, in eighteen parcels within the known geologic structure of KEVIN-SUNBURST field, Montana, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 10:00 a.m., M.S.T., March 28, 1957, when bids will be opened.

The following are the lands offered for sale, all in Principal Meridian Montana: CUT BANK FIELD, T. 33 N., R. 5 W.; Parcel No. 1, Sec. 32, Lot 3, containing 30.50 acres. T. 33 N., R. 6 W.; Parcel No. 2, Sec. 14, Lot 3, containing 10.69 acres. Parcel No. 3, Sec. 24, SW¼ NE¼, containing 40.00 acres. T. 35 N., R. 4 W.; Parcel No. 4, Sec. 19 E½ SE¼, containing 80.00 acres. T. 36 N., R. 5 W.; Parcel No 5, Sec. 29, NE¼ NE¼, containing 40.00 acres. KEVIN-SUNBURST FIELD, T. 34 N., R. 2 W.; Parcel No. 6, Sec. 4, Lots 3, 4, SE¼ NW¼, containing 120.17 acres. Parcel No. 7, Sec. 5, N½, containing 319.84 acres. Parcel No. 8, Sec. 6, Lots 1, 2, 3, 4, 5, 6, 7, SE¼ NW¼, NE¼ SW¼, containing 343.08 acres. T. 34 N., R. 3 W.; Parcel No. 9, Sec. 1, Lots 1, 2, containing 79.99 acres. T. 35 N, R. 2 W.; Parcel No. 10, Sec. 12, NE¼, containing 160 acres. Parcel No. 11, Sec. 18, NE¼ NE¼, containing 40.00 acres. Parcel No. 12, Sec. 19, E½ NE¼, NE¼ SE¼, containing 120.00 acres. Parcel No. 13, Sec. 19, SE¼ SW¼, containing 40.00 acres. Parcel No. 14, Sec. 20, W½ NW¼, NW¼ SW¼, containing 120.00 acres. Parcel No. 15, Sec. 20, NW¼ NE¼, containing 40.00 acres. Parcel No. 16, Sec. 31, Lots 1, 2, 3, 4, E½ W½, NE¼, W½ SE¼, containing 542.08 acres. Parcel No. 17, Sec. 32, S½ NW¼, E½ SW¼, SE¼, containing 320.00 acres. Parcel No. 18, Sec. 33, N½ S½, SW¼ SW¼, containing 200.00 acres. T. 35 N., R. 3 W.; Parcel No. 19, Sec. 4, Lots 1, 2, S½ N½, containing 238.58 acres. Parcel No. 20, Sec. 7, S½ SE¼, and Sec. 18, N½ NE¼, containing 160.00 acres. Parcel No. 21, Sec. 26, SE¼ SE¼, containing 40.00 acres. Parcel No. 22, Sec. 35, SE¼, containing 160.00 acres. T. 36 N., R. 2 W.; Parcel No. 23, Sec. 35, SE¼ SE¼, containing 40.00 acres. Details of the lease offering, how and where to submit bids, may be obtained from the Manager of the Land Office, 1245 North 29th Street, Billings, Montana. Theo E. Anhder, Manager, Land Office.

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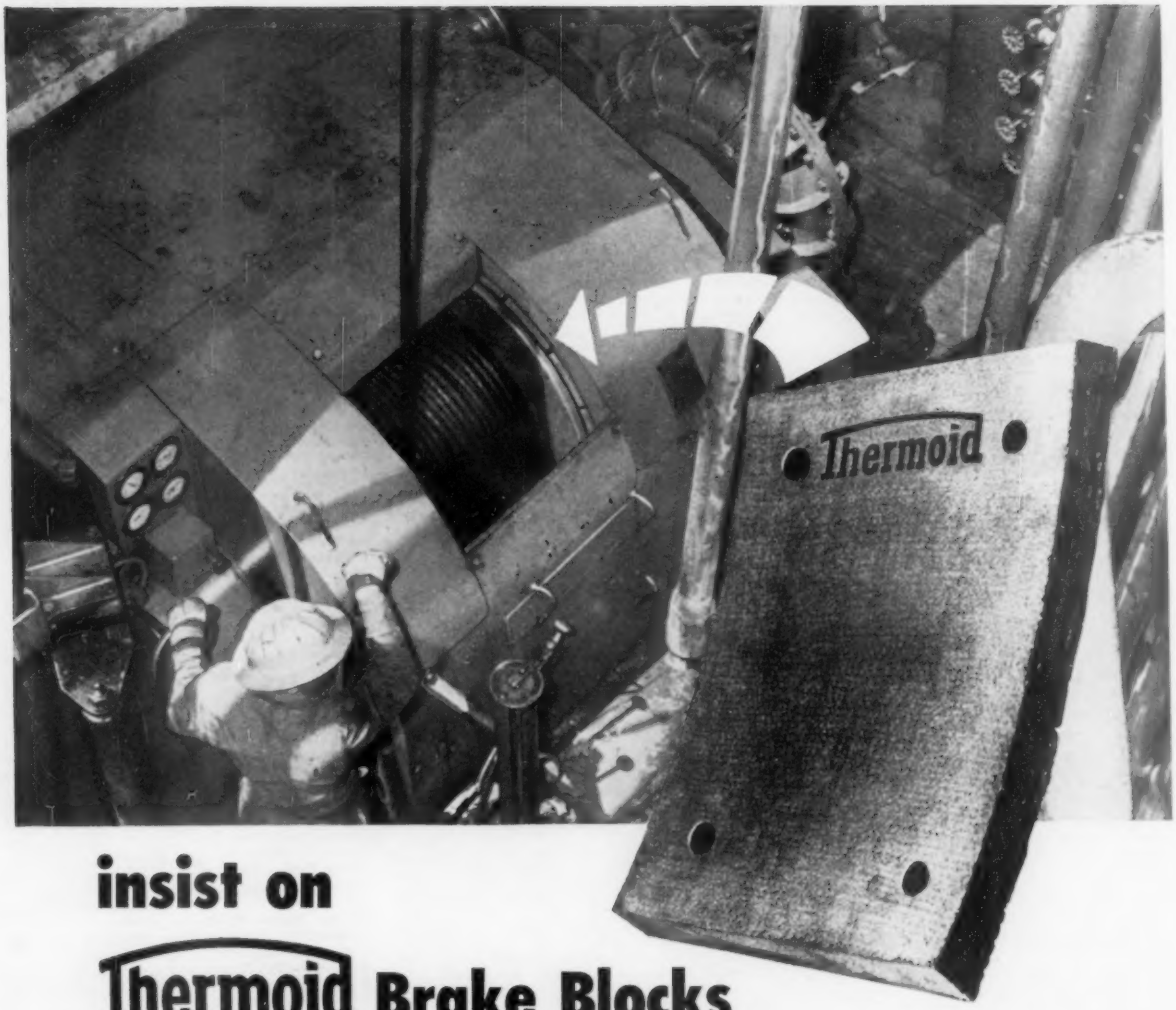
LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. By virtue of the authority vested in the President and pursuant to Executive Order No. 9337 of April 24, 1943, and Public Land Order No. 729 of June 19, 1951, notice is hereby given that 190 acres of land adjoining the northeast boundary of Camp Breckenridge, five miles southeast of Waverly and north of Highway 56 in Henderson County, State of Kentucky, will be offered for oil and gas lease through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 P.M., E.S.T., on March 20, 1957. Details of the lease offer, copies of the lease agreement with plat of lease area and special stipulations, and bid forms, may be obtained from the Oil and Gas Supervisor of the Geological Survey at 239 Federal Building, Tulsa, Oklahoma, and 3233 General Services Administration Building, Washington, D. C.; or the Washington Headquarters Office or Eastern States Office of the Bureau of Land Management, Washington, D. C. L. E. Hoffman, Minerals Staff Officer.



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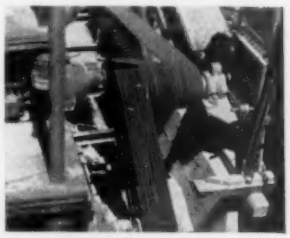

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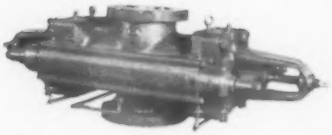
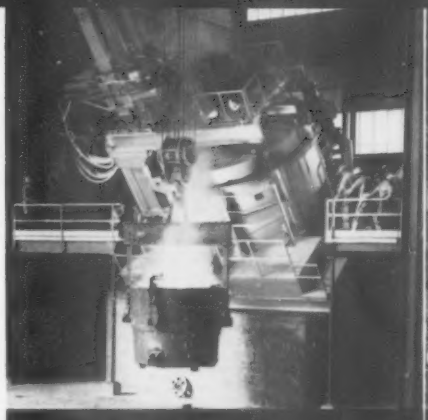
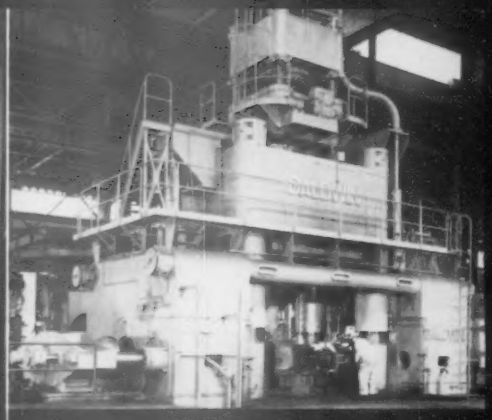


You are drilling an oil well . . .

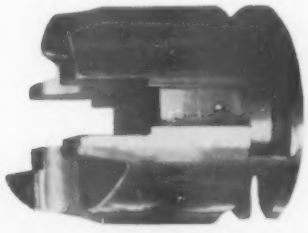
You are a vital link in a world necessity. Success or failure often depends on your equipment. Take the rams in your blowout preventers — the "business end" of these important components. Here's why the Cameron "QRC" rams are so efficient—



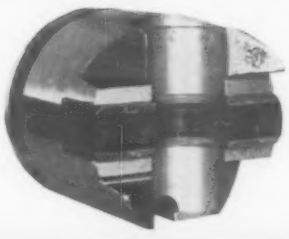
1. High quality alloy steel is produced in the Cameron melt shop under strict control.



2. Billets from this steel are forged into rams on the multi-million dollar Cameron-designed presses.

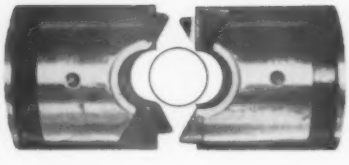


3. After machining and flame-hardening, the ram looks like this.

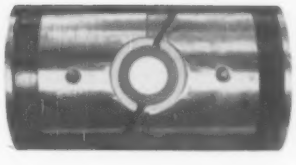


4. The complex frontal surfaces vary in different rams according to pipe size.

5. Steel reinforced "QRC" ram packing element. A big volume of Hycar oil and abrasion resistant rubber stops extreme well pressures.



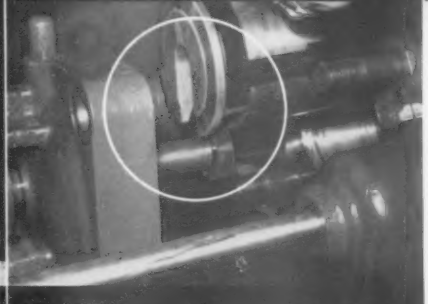
6. Wing guides automatically center pipe as rams are closed.



7. This view shows the rams closed without pipe in the hole. Note the red area indicating the big reserve of Hycar which is fed automatically to the pipe surface.

8. The rear seal ring traps well pressure, energizing the ram to maintain a constant seal.

9. In the Cameron Quick Ram Change there is no lifting, sliding or juggling of rams by hand on slippery cellar surfaces. Rams are safely lifted by catline — changed in minutes.



10. Preventers must open against extreme pressure. Consider this engagement between ram and ram connecting rod. Again the design is tough — tough enough to retract under any condition.

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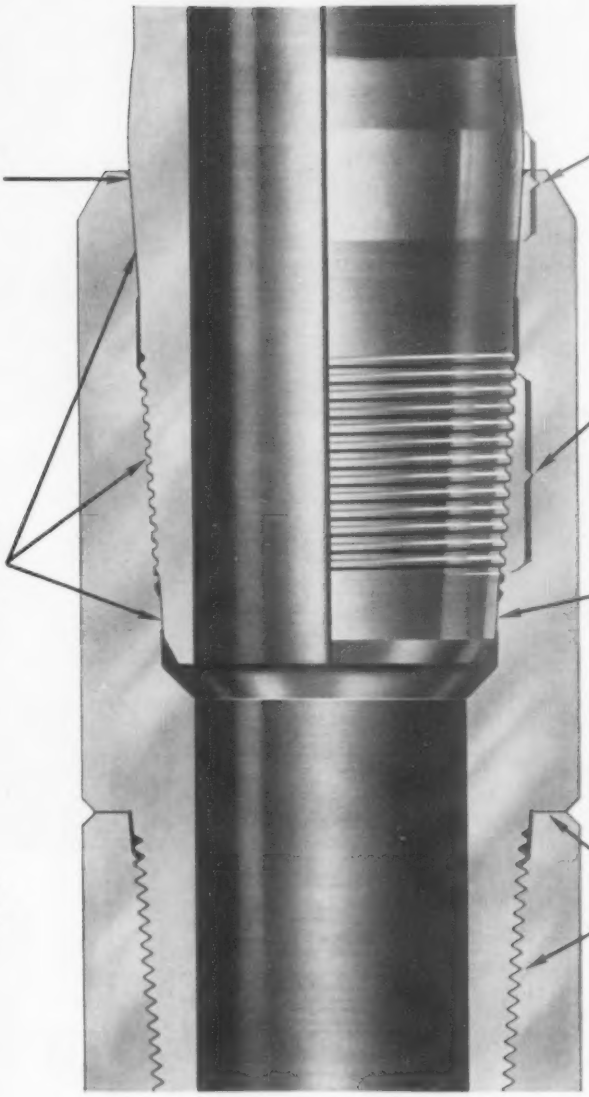

Steep taper permits thick section at point of last contact between pipe and tool joint where bending loads in pipe are greatest.

This critical area of the pipe is **cold-rolled** at the mill for greater strength, using equipment and techniques developed by Hughes engineers.

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All mating surfaces — the outer seal, pipe threads, and inner seal — are on the same taper. This provides uniformity of fit on initial and replacement installations.

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Copperplating of threads and shoulders of Hughes tool joints protects against scoring and galling.

Hughes offers improved SEAL GRIP assembly

The process and equipment developed by Hughes for cold rolling the large land area of the drill pipe at the pipe mill produce a superior "Seal Grip" assembly unequalled in strength and dependability.

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Developers of "Flash-Weld," "Seal Grip" and Counterbore Weld Tool Joints